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The New Year

For foundrymen, 1952 will indeed be difficult. It opens up with announcements of increased prices for scrap, aluminium and linseed oil, and these follow many other recent advances in the price of raw materials. It is not only price, but real shortages which seem to affect the larger concerns more than the smaller ones. The financing of purchases will become more and more difficult, and care will have to be taken that a proper costing system discloses the impact of all these extra disbursements. In France, one asks, after a meal, for the "addition," which wags have nowadays changed to the "multiplication." So it is with the conduct of business to-day, for increases associated with fuel and transport affect every item bought.

The technical programme envisaged for this year, as is characteristic of the post-war period, is heavily charged. There is, of course, the usual annual conference of the Institute of British Foundrymen which is to be held under the presidency of Dr. Dadswell at Buxton. Then there is the International Foundry Congress to be held in Atlantic City in early May. To these must be added the fourth Foremen's Conference at Ashorne Hill, the day of national works visits and no doubt there will be one or more national meetings organized by the British Cast Iron Research Association. Finally, the heavy non-ferrous industry is to arrange a productivity conference.

Taking on the rôle of a prophet, we believe that the steelfoundry industry will show increased activity, ironfounding will show a small decrease in production, but we believe a better productivity. Of the non-ferrous side, only those firms engaged on the rearmament programme will enjoy a full order book, for the present restrictions will hamper very seriously those working for the ordinary domestic market. The foundry-equipment industry will have to meet increasing competition in the export field. It has done extremely well since the war, but now with the revival of activity amongst Continental countries, overseas business will be more difficult to obtain. If this industry continues to show the enterprise it has in recent years evinced, the home market should be reasonably secure. Stress must be laid on service after sales as this is always more satisfactory from home manufacturers than from overseas. This year will be one of great difficulty, but there are signs that next year will be easier for our industry. The truth of the matter is that the country has to adapt itself to a new set of price levels and once these are established, future prosperity will depend on our ability to stabilize them. The alternative will result in financial chaos. If stabilization can be effected, as we believe it will, a change for the better can be envisaged.

H.

New Year Honours

The New Year Honours List contains the names of many people associated with the foundry, iron and steel, and allied industries whose services have been recognized by awards contained in the List. Notes on some of the awards are given below.

Knights Bachelor

PROF. LEONARD BAIRSTOW, chairman of the Aeronautical Research Council.

MR. GEORGE PERCY BARNETT, H.M. Chief Inspector of Factories since 1947.

MR. JOHN LUCIAN BLAKE, Comptroller-General, Patent Office.

MR. JOHN POLAND BOWEN, formerly Engineer-in-Chief, Corporation of Trinity House.

MR. ROBERT FURNESS FRYARS, chairman and managing director of A.C.V. Sales, Limited, a director of Associated Commercial Vehicles, Limited, Hardy Motors, Limited, and other companies, and chairman of the British Transport Vehicle Manufacturers' Association.

MR. DAVID RANDALL PYE, lately Provost of University College, London. He served with Mather & Platt, Limited, the Manchester engineers, before becoming lecturer in Engineering Science at Oxford University in 1909. He was deputy director of Scientific Research at the Air Ministry from 1925 to 1937 and director from 1937 to 1943.

MR. ALFRED ERNEST SHENNAN, a director of North Western Industrial Estates, Limited, and other companies.

MR. WALFORD HOLLIER TURNER, chairman of W. & T. Avery, Limited, the Birmingham founders and manufacturers, Wright's Ropes, Limited, the Rollason Wire Company, Limited, Henry Pooley & Son, Limited, and other companies. His directorships include that of the Wellington Tube Works, Limited.

MR. ALEXANDER WILLIAMSON, chairman and managing director of William Beardmore & Company, Limited, steelmakers, of Glasgow, and chairman of the Glasgow Railway Engineering Company, Limited. He was Master of the Cutlers' Company of Hallamshire in 1934-35.

Order of the Bath

C.B.

MR. LESLIE HAROLD ROBINSON, under-secretary, Ministry of Supply, since 1948.

Order of St. Michael and St. George

C.M.G.

MR. HOWARD OWEN HOOPER, assistant secretary, Ministry of Materials.

MR. KENNETH ARTHUR DAVIES, director of geological survey, Uganda.

Order of the British Empire

K.B.E.

MR. L. B. HUTCHISON, deputy secretary, Ministry of Supply, since 1948. BARON TERRINGTON, chairman of the National Arbitration Tribunal.

C.B.E.

H. ARNOLD, purchasing manager of Pilkington Bros., Limited, glass manufacturers, of St. Helens (Lancs). G. L. BAILEY, director of research of the British Non-Ferrous Metals Research Association. A. F. BENNETT, a director and general manager of the Automatic Telephone & Electric Company, Limited.

H. H. BURTON, a director of the English Steel Corporation, Limited, Darlington Forge, Limited, Firth-Vickers Stainless Steels, Limited, and Industrial Steels, Limited; S. J. CAMPLING, assistant secretary, Board of Trade; J. R. GEBBIE, managing director of Wm. Doxford & Sons, Limited, the Sunderland shipbuilders, and a director of Sigmund Pumps, Limited. President of the Shipbuilding Conference, he is a member of the council of the Institution of Naval Architects.

DR. H. HARTLEY, chairman of Radiation, Limited, Birmingham; PROF. T. P. HILDITCH, F.R.S., latterly Campbell Brown Professor of Industrial Chemistry at Liverpool University; D. G. HOOPER, assistant secretary, Ministry of Supply; D. MARSDEN-JONES, manager of the labour relations division of the Ford Motor Company, Limited.

D. REBBECK, a director of Harland & Wolff, Limited, the Belfast shipbuilders, and other companies. G. R. SANKEY, deputy managing director of Joseph Sankey & Sons, Limited, steel rollers, etc., of Bilston (Staffs), and a director of other steel companies, including Brymbo Steel Works, Limited, and Transformer Steels, Limited. J. WILSON, general manager and secretary of the Clyde Navigation Trust.

A. E. H. MASTERS, chief scientific officer, fighting vehicles design establishment, Ministry of Supply; G. W. MIDDLETON, general secretary, Scottish Trades Union Congress; R. F. NEWMAN, a director and general manager of Transport Equipment (Thornycroft), Limited, London; M. W. PERRIN, lately deputy controller, Atomic Energy Division, Ministry of Supply.

O.B.E.

G. H. FLETCHER, for services as chairman of the Sheffield and Doncaster District Committee, East and West Ridings Regional Board for Industry, who is a director of Metropolitan-Vickers Electrical Export Company, Limited; J. GUILD, senior principal scientific officer, National Physical Laboratory; H. H. HAGAN, shipbuilding director, Lobnitz & Company, Limited, Renfrew; COL. F. R. W. HUNT, chief technical adviser, Vickers-Armstrongs, Limited, London; R. JAMES, principal, Glamorgan Technical College, Treforest; W. H. G. LAKE, works manager, Imperial Chemical Industries, Limited, King's Norton; J. D. MCGEE, head of photoelectric research section, Electric & Musical Industries, Limited, Hayes (Middx); C. F. PAGNAMENTA, lately head of prices department, British Iron and Steel Federation.

H .R. PAYNE, head of safety organization, Imperial Chemical Industries, Limited, London; R. T. ROLFE, chief metallurgist, W. H. Allen, Sons & Company, Limited, Belford; A. H. SEARL, lately Director of Non-Ferrous Metals, Ministry of Materials; W. L. SIMS, director, Wadkin, Limited, Leicester; J. STRACHAN, member, Scottish Fuel Efficiency Committee; J. A. P. STRACHAN, procurement officer, technical and engineering, United Kingdom Treasury and Supply Delegation, Washington; J. WATTERS, shipbuilding manager and local director, Cammell Laird & Company, Limited, Birkenhead; J. P. WILLCOCK, Director of Supply and Transport, Home Office.

M.B.E.

H. BRADLEY, assistant engineer, South Durham Steel & Iron Company, Limited, Middlesbrough; E. BRADSHAW, senior lecturer, College of Technology, Manchester; H. BRAMHALL, section operating manager, Winnington Works, Imperial Chemical Industries, Limited; T. T. CALLISON, chief production design engineer, Bonar Long & Company, Limited, electrical plant manufacturers, of Dundee; F. J. CHARD, production manager (Brabazon project), Bristol Aeroplane Company, Limited; C. W. CROXON, senior experimental officer, Department of Scientific and Industrial Research; L. A. H. DUNN, personnel manager, Whitehead Iron & Steel Company, Limited, Newport (Mon); J. A. HAMILTON, senior scientific officer, Marine Aircraft Experimental Establishment, Ministry of Supply, Felixstowe.

(*To be continued*)

Centenaries of 1952

By G. J. S. King

One of the outstanding events in the foundry world of 1852 was that the conglomeration of glass and iron known euphemistically as the "Crystal Palace" disappeared from Hyde Park, and began to take shape in its new setting at Sydenham. Sir Charles Fox, the Midland ironmaster who had constructed the original building, was in charge of its re-erection. Other famous "men of iron" were in the news that year. The three brothers Bell (one of whom was the future Sir Isaac Lowthian Bell) founded the Clarence Works, one of the earliest and largest iron-smelting concerns on the Tees. Dr. John Percy, the famous metallurgist (who, like Sir Isaac Bell, was subsequently president of the Iron and Steel Institute), published "On the Metallurgical Treatment and Assaying of Gold Ores." (He was simultaneously engaged on the "Iron and Steel" volume of his great treatise on metallurgy, which was published many years later.)

Renowned Development Engineers

Alexander Parkes, who was then supervising the erection of copper-smelting works in South Wales, took out a third patent in 1852 for his method of using zinc for the desilverisation of lead. Robert Napier, the Camlachie ironfounder, built his first iron ship. Robert Mallet, proprietor of the Victoria foundry at Dublin, invented the buckled plate. Prof. Thomson (later Lord Kelvin), who had recently given a thermodynamic explanation of the non-scalding property of steam issuing from a high-pressure boiler, began his famous researches on the "thermal effects of fluids in motion." Karl Reichenbach, founder of the first iron foundries in Bavaria, began his researches in "odic force." The renowned Brunel was engaged simultaneously in the construction of iron bridges and ships, completing the great bridge over the Wye at Chepstow, and designing the colossal *Great Eastern*. George Thomas Clark became trustee of the Dowlais Ironworks—and it was Clark who subsequently invited Bessemer to Dowlais to conduct experiments in his process for making malleable iron direct from the ore, the result being the production of the first rail ever rolled without the intermediate use of the puddling process.

Political Aspects

That great Jarrow ironmaster, (Sir) Charles Mark Palmer, built the first iron screw collier in 1852, with a coal capacity of 690 tons. Like Sir Isaac Bell, Palmer was an original member of the Iron and Steel Institute, and there came a time (22 years later) when Bell and Palmer were elected to Parliament as fellow-members for North Durham (which then returned two M.P.s). However, the election was declared void and, when the voters went to the poll again a few months later, Palmer was elected, but Bell was rejected.

This is a reminder of the General Election of 1852, in which Robert Stephenson was elected for Whitby, Sir Josiah John Guest for Merthyr Tydfil, James Baird (a Scottish ironmaster, whose Eglinton Iron Company established works at Blair in that year) for Falkirk, and Henry Vivian (who was subsequently Lord Swansea, and was the man who made Swansea "the metallurgical centre of the world") for Truro. Incidentally, Swansea's member in the General Election of 1852 was Vivian's father, John Henry Vivian, founder of the Hafod smelting works. It was in 1852 that the Elswick works at Newcastle began their era of prosperity under the direction of the future Lord Armstrong. Henry Dircks published a work that year which advocated the claims of C. A. Jordan as the inventor of electrometallurgy.

The City of London Sewers Amendment Act came into force on January 1, 1852. It ordained that "every Furnace employed . . . in the working of Engines, by Steam, and every Furnace employed . . . in Buildings used for the Purpose of Trade, or Manufacture, within the City . . . shall in all Cases be constructed or altered so as to consume the Smoke arising from such Furnace."

In the early part of the year a disastrous dispute between ironmasters and the Amalgamated Society of Engineers resulted in the great lock-out known in Victorian days as "the Master's Strike." The men were supported by the powerful group known as the "Christian Socialists," one of whose leading members purchased the Atlas Ironworks in Southwark in the hope of running it on co-operative lines.

It has been mentioned that Sir Josiah Guest was elected (or rather re-elected) for Merthyr in the General Election of 1852; four months later—on November 26—he died. Guest was one of the country's outstanding ironmasters in the later period of the Industrial Revolution, and his many innovations in the Dowlais Ironworks included the use of hot-blast. Under his guidance, the production of Dowlais was raised to an annual total of 100,000 tons of pig-iron.

William Tierney Clark, who died on September 22 a century ago, began his career in the Coalbrookdale Ironworks, and subsequently worked under Rennie, becoming famous as a bridge-builder, his outstanding achievement being the Budapest suspension bridge. Another builder of suspension bridges who died in 1852 (on March 15) was Sir Samuel Brown, who invented an improved method of manufacturing links for chain cables, and constructed the once-famous chain pier at Brighton.

Births and Deaths

Among celebrities born in 1852 were: Sir Ernest Joseph Cassel, who was responsible for the introduction of the Thomas-Gilchrist process for the conversion of phosphoric iron ores; the first Lord Furness, proprietor of various steel and iron undertakings; Charles Coghlan, chairman of the Coghlan Steel & Iron Company, Limited, of Hunslet Forge; and Sir James Heath, ironmaster and colliery proprietor.

There was born in 1752 John Nash, the Regency architect, who was noted for the extensive use of cast iron in his buildings, and was entitled to much of the credit for the introduction of metal girders. A celebrity born in the year 1652 was William Dampier, the circumnavigator, whose "New Voyage Round the World" records that during his travels in the East some co-operative natives were rewarded with "three whole bars of iron, which was an extraordinary present to them."

Born in 1552, Sir Hugh Plat, who wrote "Of Moulding, Casting Metals," also recorded an invention of cheap fuel in his "Of Coal-Balls for Fewell wherein Seacoal is, by the mixture of other combustible Bodies, both sweetened and multiplied." Sir Walter Raleigh, who is believed to have been born in the same year, was author

Centenaries of 1952

of a "Treatise of Mines and the Trial of Minerals." As Lord Warden of the Stannaries, the interests of the Cornish tin-miners were in his charge, and he collaborated with Sir Richard Boyle in working an Irish copper mine.

A final name in a brief survey of births is that of Leonardo da Vinci, the most versatile of men, who was born in 1452. He anticipated the achievements of a future age by inventing water-mills, the smoke stack, and saw the possibilities of steam as a motive power.

There occurs on October 30 the centenary of the death of George Buchanan, a Scottish engineer who wrote on "Furnaces." Other notabilities who died in 1852 were: Edward Cowper (October 17), chief improver of the steam printing machine; John George Children (January 1), a mineralogist who translated an old French work on the calcination of metals; Walter Hancock (May 14), who invented a steam engine which enjoyed temporary success on roads; and George Richardson Porter (September 3), whose famous "Progress of the Nation" gives valuable information regarding the development of British iron manufactures and mining.

Visited by the Mayor

Surprise that a foundry could be kept so clean and airy was expressed by the Mayor of West Bromwich (Councillor A. Medley), when, accompanied by the Mayoress, he visited the Black Lake Foundry of Alfred Ellison, Limited, makers of high-grade grey-iron castings. He paid tribute to the design of the foundry with its high roof, and open spaces, and expressed interest in the arrangements made for ventilation in the new office block.

The Mayor and Mayoress were received by the foundry manager, Mr. A. V. Shanks, and were joined in their tour of the foundry by Mr. Sam Poulton, the production manager. The visitors were shown the various stages in the production of castings and displayed particular interest in the coreshop and moulding department, the tapping of the cupola and the pouring of the molten metal into the moulds.

Questions were asked on the modern equipment recently installed to keep the foundry abreast of the times and the Mayor and Mayoress were keenly interested in the efforts made to ensure full output even when power cuts were effected.

The family spirit prevailing throughout the foundry received further comment from the guests, and during conversation with many foundrymen they showed pleasure at the large number of young employees working side by side with their fathers and uncles, absorbing the knowledge and craftsmanship that has taken many years to reach perfection. The training scheme for producing the foundryman of to-morrow was also a source of much interest to the visitors, and they were glad to learn that there was no lack of recruits.

I.V.E. New Members

The Council of the Institute of Vitreous Enamellers has elected the following new members of the Institute.

As Members.

Mr. H. W. Clewes, of J. A. Jordan & Sons, Limited, Bilston; Mr. L. R. M. Imbert, of Gerard Becuwe, Limited, Soissons (Aisne), France; Mr. T. R. Goodwin, of "Wood" Brand Enamels, Stone; and Mr. R. F. Judd, of Ferro Enamels, Limited, Wombourn.

As Associate Members.

Mr. T. D. Vaughan and Mr. B. Zick, both of Ferro Enamels, Limited.

International Foundry Congress, 1952

Preparations are now well under way for the International Foundry Congress and Show of the American Foundrymen's Society which will be held in Atlantic City from May 1 to 7, 1952. The A.F.S. expects that between 300 and 400 international visitors will attend the congress, and a two-week pre-congress study tour of major foundry centres is being arranged for them. Each day of the congress will be specially designated and some special appropriate activity will be scheduled. Thus, May 1 is Defence Day, with participation of the armed services; May 2 is Chapter Day, the highlight of which will be a chapter officers' and directors' dinner. On May 3, President's Day, will be the annual business meeting and banquet. May 4, International Day, features the international reception for guests from abroad. May 5 is Management Day, with sessions for management. Old Timers' Day, May 6, will feature a moulding contest for old timers in the industry, and May 7 is Exhibitors' Day.

All technical meetings and exhibits will be held in the Convention Hall, with an exhibition of 90,000 sq. ft. on one great floor. Exhibits will be open all seven days. Technical meetings will be held on six days only, with committee meetings only on May 4. On May 2 and May 6 transport will be made available for visits to nearby foundries; individual trips can be made on the other five days.

Presiding officers of the congress will be Mr. Walter L. Seelbach, president of Superior Foundry, Inc., Cleveland, as president of the American Foundrymen's Society, and Signor Guido Vanzetti, president of the Milan Steel Foundry Company, Milan, as president of the International Committee. Mr. C. V. Nass, Beardsley and Piper Division of the Pettibone-Mulliken Corporation, Chicago, is the general chairman of convention committees as president of the National Castings Council.

Latest Foundry Statistics

The Bulletin of British Iron & Steel Federation for November, reports the average number of people engaged in the ironfoundry industry for the week which ended on October 6, 1951, was 151,417, of whom 141,469 were men. The corresponding figures for September were 150,015 and 140,241. For steelfounding, the figures for October were 19,512 and 18,846 and in September 19,362 and 18,369.

The average weekly amount of metal melted for the production of steel castings during October was 10,300 tons as against 10,000 tons in September and 9,100 tons in October, 1950. The average deliveries, however, were not so good, the corresponding figures to those cited above being 4,500, 4,900, and 4,800 tons.

The Council of Ironfoundry Associations in their December bulletin, report the production of grey cast iron during the third quarter of the year was 853,446 tons and of malleable 34,250 tons—a figure which points to a record production since statistics became available. It may or may not be higher than production in the inter-war period.

Spring Conference

The Spring conference of the Institute of Vitreous Enamellers will be held at Southport, Lancs, on May 22 and 23, 1952, with headquarters at the Prince of Wales Hotel. It is proposed that the conference should consist of a works visit on the Thursday and technical sessions on the Friday. Full particulars will be published at a later date.

Quantity Production of Spheroidal-graphite Cast Iron*

[slightly abridged]

By N. Croft

Introduction

MOST foundry developments, and particularly those relating to metals, can be considered to be divisible into three phases. The first is that in which the new or improved material, initally produced in the laboratory, is found to possess some outstanding property or combination of properties. The research metallurgist then concentrates on duplicating his results and in further improving or simplifying his process. When this is achieved and he has shown that he can produce his results consistently, the data so gathered are passed to the foundry and initial field trials begun.

In this second stage, the work initiated in the laboratory is continued upon a foundry scale under commercial conditions and, by this means, sample castings are produced for further laboratory tests and for field trials. It is usually necessary to provide a considerable number of sample castings and test-pieces so that the engineer and designer may amass sufficient information of the type they require to enable them to determine how best the new material can be employed and what modification in design its improved properties can permit. Moreover, the engineer is a conservative person, not ready to change his previous procedure without much careful checking and proving. For this reason, much work is usually involved and much time occupied in service tests which often require months, or even years, for completion. The final stage of the development is entered when the results of field trials are known and the parts produced in quantity for normal commercial usage.

The magnesium process for the production of spheroidal-graphite cast iron has proved no exception to this rule. The effect on the graphite form of the introduction of magnesium to molten cast iron was first discovered in the laboratory of the International Nickel Company, Inc., development and research department, at Bayonne, New Jersey, U.S.A. and, following careful investigational work of the type earlier outlined, the process was developed sufficiently for field trials to be commenced in foundries. The development of the magnesium process outside America was simultaneously being guided by the development and research department of the Mond Nickel Company, Limited, and they, too, after exploratory and proving work in the laboratory and under foundry conditions, initially granted manufacturing licences to a few British foundries.

The foundry development in Britain did not progress rapidly at the outset because it had been found that the majority of the pig-irons available in the U.K. were not 100 per cent. responsive to treatment, due to the presence, in appreciable proportions, of incidental elements known to exert an interfering influence on formation of spheroidal graphite. This situation was particularly troublesome in Britain on account of the shortage of native hematite ores and because of the enforced use, in considerable proportions, of iron-bearing materials of abnormal types.

However, as a result of the ready co-operation given by some of the main producers of pig-irons, fully suitable grades were developed and British pig-irons now available from several sources give complete response to magnesium treatment. With these initial arrangements satisfactorily made, the licensed foundries proceeded with the production of sample castings in fulfilment of trial orders by interested potential users. The remarks which follow relate to the actual experience of the Author and his firm. In all cases, close check was kept on the performance in service of the castings first made, and steadily, as these reports were received and the results found to be up to, or, as has usually been the case, in excess of expectation, they were accompanied by orders for supply of the relevant components in quantity and the orders placed with the Author's firm have for some time past, in respect both of volume and the quantities off, merited production by repetition methods and have justified turning over part of the machine-moulding capacity to the routine production of castings in "S. G. Iron."

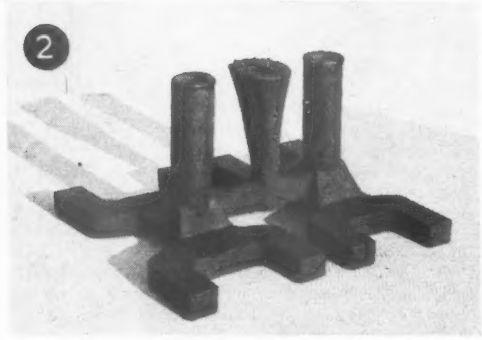
In turn, as the volume of orders has increased and these steps have been justified, the changes in procedure have necessitated changes in technique, in foundry organisation and in production control, all of which have successfully been effected.

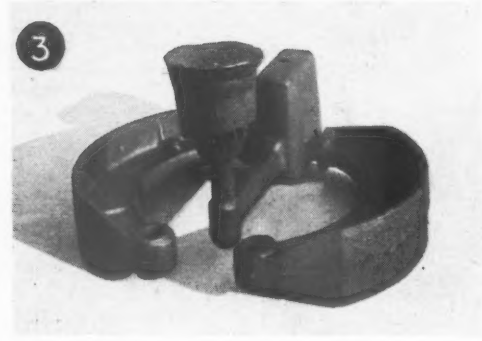
Metal

Melting is at present carried out in orthodox acid-lined cupolas. The materials comprising the charges are:—(*a*) Refined pig-iron, low in manganese, phosphorus and harmful incidental elements; (*b*) selected mild-steel scrap, and (*c*) S. G.-iron for remelting.

The charge is calculated to give, at the cupola spout, iron of the following percentage composition:—T C: 3.2 to 3.4; Si: 1.7 to 1.9; Mn: 0.5 max., generally 0.3 to 0.4; S: 0.08 to 0.10 (It is preferred that this be as low as can consistently be achieved but in some cases in which the sulphur

*Official Exchange Paper from the Institute of British Foundrymen to the Brussels International Foundry Congress. The Author is chief metallurgist, Lloyds (Burton), Limited, Burton-on-Trent.





has been as high as 0.12 per cent. the metal has, nevertheless been treated satisfactorily.) and P: 0.10 max., normally 0.05 to 0.10.

Though S. G. iron can be produced with any of the matrices possible of attainment in flake-graphite iron, the main interest at present, from the viewpoint of commercial production, is undoubtedly in the grades with matrix structures of pearlite or of ferrite or of combinations of pearlite and ferrite. Base iron of the composition given is ideally suitable for this purpose and only a short annealing cycle is necessary to produce fully ferritic structures.

Cupola Practice

The cupolas are fitted with continuous tapping, front-slagging spouts and the metal is run into a heated tilting receiver. When the day's need for flake-graphite iron is nearly satisfied, the cupola blast is shut off, the bed is replenished and the materials for the special iron are then charged. By experience and close observation of the progress of melting in the cupola it is possible to be certain when the transition from the normal to the special charges is actually complete. At this point, the cupola blast is again switched off while the receiver is emptied and melting of the special base-iron subsequently proceeds. Care is taken to ensure that an amount of molten iron equivalent to several charges is collected in the receiver before the first tap is taken for treatment. This ensures satisfactory composition in the base iron. The transition metal is, of course, suited in composition for production of high-grade flake-graphite irons, and is used for that purpose. No molten metal needs to be discarded.

Magnesium Treatment

As is well known, introduction of magnesium is best effected by making use of suitable alloys in which the magnesium, preferably present not in excess of 20 per cent., is alloyed with a suitable carrier, such as nickel, sometimes in association with silicon or copper or both. If the magnesium content of the addition is greater than 20 per cent., the reaction on addition to molten cast iron in the normal manner becomes sufficiently violent to be dangerous, the violence increasing with the concentration of magnesium. Furthermore, as the concentration of magnesium in the alloy is increased the lower and the less reliable becomes its efficiency. For these reasons, alloys containing magnesium in excess of 20 per cent. are unsuitable for use under production conditions, since they fail to give the day-to-day and treatment-to-treatment reliability of magnesium recovery and the freedom from hazard which production processes must exhibit.

Nickel is the most efficient carrier metal and any replacement of nickel by other metals for this

FIG. 1.—*Method adopted for Gating and Feeding Hydraulic-jack Lever Castings in S. G. Iron.*

FIG. 2.—*Spray of Moulding-box Clamps produced for Internal Use.*

FIG. 3.—*Method of Gating and Feeding Large Brake-shoe Castings.*

FIG. 4.—*Use of Two Side-feeders on a Disc Saucer.*

purpose results in lower recovery of magnesium and some loss in reliability of recovery. For these reasons, although the nickel-base addition alloys have the greatest first cost they are, by reasons of their greater efficiency and reliability, as economical at the present time as any alternative alloy yet made available, especially for the treatment of cupola iron, that is, iron of relatively high sulphur content.

The preferred method of addition of alloy to the molten metal depends principally upon the type of alloy used. As the nickel/magnesium is of high specific gravity, the most efficient method has been found to be the simplest one, namely, addition of the alloy in the form of large lumps to the metal in the filling ladle. Alternatively, it is sometimes preferred to place the alloy lumps on the ladle bottom and tap rapidly on to them.

The magnesium combines readily with sulphur and the sulphur is reduced to very low levels before magnesium is retained in the treated iron. Some of the magnesium is, of course, lost by oxidation. The various alloys have each the ability to use effectively, in desulphurising and in building-up the essential residual content of magnesium, a certain proportion of the magnesium added. This proportion is known as the " magnesium recovery." Therefore, the amount of alloy needed to produce spheroidal-graphite iron is calculated from:—

(1) Consideration of the magnesium required to remove the sulphur, plus,

(2) the magnesium required to be retained in the treated iron, all qualified by,

(3) the magnesium recovery known to be expected from the alloy used, under the conditions in which it is used, and

(4) the actual magnesium content of the alloy.

Addition Control

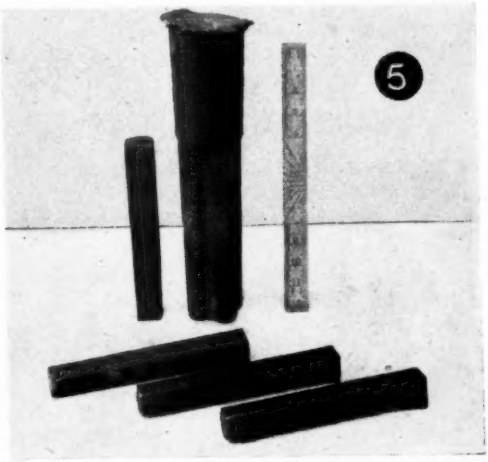
From this description, the necessary calculation would seem to be a somewhat involved procedure, but in actual fact the addition required in any set of circumstances can readily and accurately be read off from a simple table. An elementary prerequisite of any process required to be carried out regularly with consistent results is that the quantities involved should be accurately controlled. For this reason it is not sufficient merely to weigh the quantity of alloy—the mass of molten iron to be treated must also be weighed. In the Author's foundry this is done very simply by use of a dial-indicating weighing scale which is slung on the crane hook and from which the ladle is suspended.

The required and weighed quantity of alloy is added to the pre-heated treatment ladle and the required amount of molten iron poured on to it. The reaction causes considerable ebullition and an intense white glare, but although these effects are spectacular there is no danger of explosion or of ejection of metal from the ladle when a suitable alloy is used. Blue glasses should be worn by those in attendance, to protect the eyes from the glare, and the ventilation should be adequate to carry the magnesia fume from the work place. When the action has subsided the molten iron is seen to be covered with a drossy slag, consisting chiefly of magnesium sulphide.

Ladle Test

It is a simple matter, at this stage, by use of a rapid empirical test, to determine whether or not the iron has been satisfactorily treated. If the test shows incompleteness of treatment, that is, insufficient residual content of magnesium, further addition can be made prior to pouring. It may be emphasised, however, that when careful control is maintained on all phases of technique, adjustment in this way is very rarely necessary.

The slag can be dealt with in several ways, but in the Author's foundry the following simple method has been found the best. The slag in the treatment ladle is covered with a layer of silica sand, which binds it into a cake. At the casting



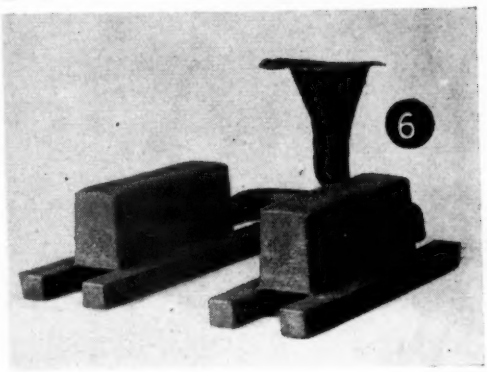
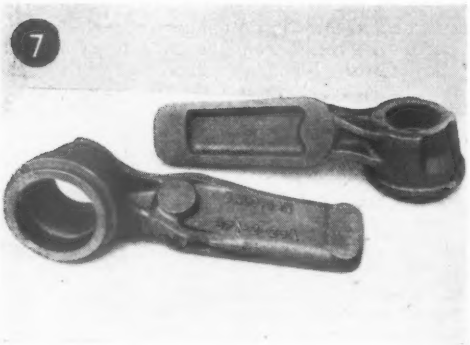
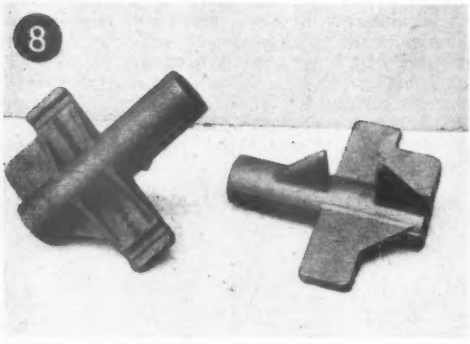
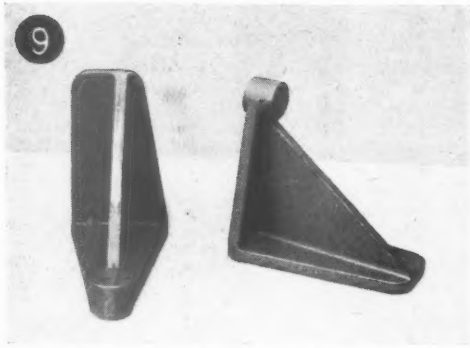


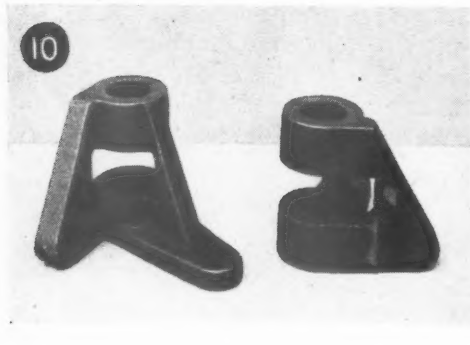
FIG. 5.—*Clover-leaf Test-bar used for Yield, Tensile-stress and Elongation determination. The four Test-pieces obtained are shown in the Foreground.*

FIG. 6.—*Test-bars 1 in. square for Transverse-load and Rupture-stress Determinations, showing the Method adopted to ensure Sound Specimens.*









points, pouring ladles of tea-pot design, pre-heated to high temperature, are in readiness. The treatment ladle is moved to the casting point and the required quantities of magnesium-treated metal are run into the pouring ladles, the slag being held back in the treatment ladle by use of a wooden-bladed, long-handled skimmer. As this is being done, a graphitising addition of ferro-silicon is added in each case, to counteract the powerful carbide-stabilizing effect of the magnesium. The treatment ladle, when empty, is turned over to discharge the caked slag and is returned to the furnace for the next treatment.

This technique is particularly efficient when several ladles of treated iron are required in succession, because not only does it effectively trap all the slag but it also eliminates the manual operation of skimming, which is a tedious operation and invariably results in build-up of dross around the slagging lip of the ladle. Addition of certain fluxes can, of course, considerably reduce this build-up, but when several treatments are required to be conducted in succession it is essential to keep the ladles as clean as possible.

In the Author's foundry, by arrangement with the moulding department, routine treatment and the convenience of all concerned is suited by the fact that each ladle contains the same weight of molten metal, namely, 2,000 lb.

Moulding and Coremaking

The operations of moulding and coremaking create no new problems, and practice which is satisfactory for good-quality grey iron will be equally suitable for spheroidal-graphite iron. Moulding- and core-sands which are satisfactory for production of castings in flake-graphite iron will suit production of castings in S. G. iron but permeability in excess of A.F.S. No. 40 is to be preferred. Mould coatings and core-washes which are suitable for grey irons are likewise satisfactory for S. G. iron and the experience of the Author and his colleagues is that, with all other conditions equal, castings in S.G. iron strip more cleanly from the mould than do similar castings in flake-graphite irons.

Gating and Feeding

It is important to arrange for smooth delivery of clean metal to the mould cavity. If even small quantities of the magnesium-sulphide slag find their way into the casting they can cause deterioration of the mechanical properties. For this reason, in addition to the precautions already mentioned, namely, slag thickening and its retention in the treatment ladle and use of tea-pot ladles for pouring, incorporation of suitable slag-traps in the gating system is extremely desirable. These should be of the types which are designed to deliver clean metal with least turbulence. For this reason, strainer

FIGS. 7 *to* 10.—*Examples of Castings for Use on Agricultural Implements.* FIG. 7.—*Disc Bearing Brackets, in Annealed S. G. iron; weight* 28 *lb.* FIG. 8.—*Axle Brackets, Annealed; weight* 24 *lb.* FIG. 9.—*Self Lift Anchor Bracket, Annealed: weight* 12 *lb.* FIG. 10.—*Adjusting Screw Bracket: Annealed; weight* 13 *lb.*

cores are not so desirable as are chokes, dams and skimming bobs, or traps such as are provided in feeders of the whirlgate type.

It is also desirable to make use of runners of relatively large cross-sectional area, and ingates of sufficient total area, to ensure that the mould can be filled quickly. Moreover, it is important to arrange for the metal to enter the mould cavity quietly. The pouring basin should be kept full, and the gating system completely flooded, during pouring of the mould.

If sulphide slag has been allowed to enter the mould its presence can be detected by the appearance of small black particles on the upper surface of the casting and, in the case of green-sand work, by the formation of small sub-surface pinholes. Both types of defect are extremely undesirable and must be eliminated by the procedure already described.

The liquid shrinkage exhibited by S. G. iron appears to be very similar to that experienced in steelfounding. This is illustrated by the piping shown in the feeder heads and downgates in Figs. 1 and 2. For this reason it is important to position the feeders intelligently. In the case of castings of non-uniform section, the golden rule is to arrange to gate through the feeder into the heaviest section of the casting and so promote directional solidification through the lighter parts into the heavier parts and so into the feeder. Risers should not be used except in special cases in which isolated heavy masses of metal cannot be fed by any other means: in such cases the risers should be of adequate mass for the purpose. When these rules are observed potentially-difficult castings give little trouble in practice. Particularly successful use can be made of side-feeders, open, closed and atmospheric, preferably of the whirlgate type, and of " block " or " flash " feeders. Two further examples of the application of side feeders are shown in Figs. 3 and 4.

Practical tests have proved that the fluidity of the fully-treated and inoculated iron is little, if any, less than that of the base metal, and thin sections can be cast quite successfully. The uninitiated observer should guard particularly against deception in this matter by the appearance of the metal after reaction has just died down in contrast to the intense glare from the magnesium treatment.

Contraction

Patternmakers' contraction varies little from that of the base iron, so that only when the castings are quite large or are required to conform to very close dimensional limits is it necessary to make special pattern equipment. In the Author's experience, the pearlitic type of S. G. iron exhibits contraction of about 1 part in 80 but the expansion which accompanies the annealing treatment and which is due to formation of additional graphite from carbon previously present as carbide, results in an overall contraction of only about 1 in 120.

Fettling

In the as-cast condition the castings are very similar in outward appearance to those in normal grades of high-duty cast iron. They can readily be identified, however by the characteristic ringing tone which they emit when struck by a hammer. As earlier stated, castings in S. G. iron generally strip more freely from mould and dressing can be carried out by chisel, chipping hammer or grinder in the normal way.

In the majority of cases it is not practicable to knock off feeder-heads by use of a hammer, and even when the sections are sufficiently small to allow this to be done, the heads tend to break into the casting. It is therefore more satisfactory, before using a hammer, to notch the casting around the feeder with a chisel or a suitably-shaped cutting wheel. In some cases the use of Washburn cores or " necked down " junctions makes it possible for feeders on heavy castings to be knocked off easily and safely. A preferable alternative, however, is the practice to cut off the feeders, etc., by use of the oxy-acetylene flame in a manner similar

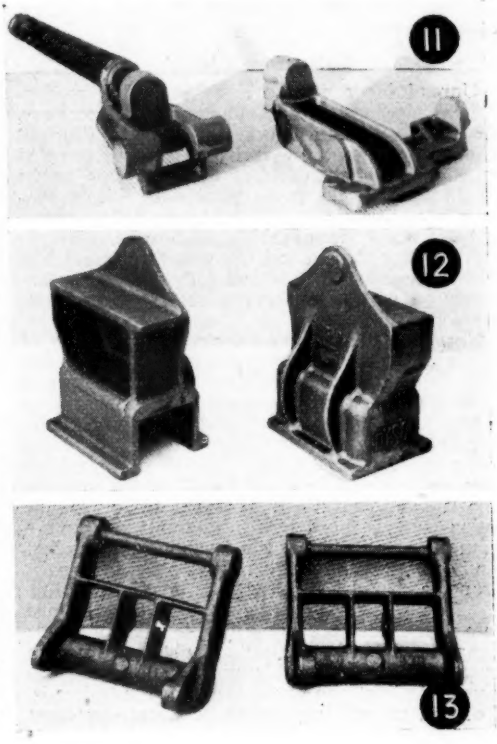


FIG. 11.—*Handle Pivot Bracket and Steering Pivot Bracket, Annealed, for Use on Electrical Vehicles; weight* 10 *and* 9 *lb. respectively.*

FIG. 12.—*Spring Housings for use on Vehicle Trailers; weight* 16 *lb.*

FIG. 13.—*Roller Brackets in Annealed S. G. iron; weight* 5½ *lb.*

to that used on steel castings. It will probably come as a surprise to the inexperienced to know that this can be done quite readily in the case of S. G. iron although it is normally an impracticable procedure with flake-graphite iron.

Heat-treatment

When castings are required with a fully ferritic matrix it is normally necessary to anneal them. It is an advantage if the S. G. iron castings can be segregated into two classes:—(*a*) those of sectional thickness less than 1 in. and (*b*) those of sectional thickness greater than 1 in.

Castings in class (*a*) which are required to be ferritic are given the full annealing cycle which involves holding in the temperature range 850 to 950 deg. C. for 1 to 4 hr., cooling to 725 to 680 deg. C. and holding for 4 to 12 hr. Castings in class (*b*) required to be fully-ferritic are given only the sub-critical annealing treatment.

Heavy castings, which because of their slow rate of cooling in the mould have a predominantly ferritic structure as-cast, and which are required to be pearlitic can, of course, be treated suitably by raising above the critical temperature and thereafter cooling in air. Those castings which are not otherwise heat-treated or which have been withdrawn from the furnace to cool in air are given a low-temperature anneal at 500 deg. C. which the Author's firm considers desirable in order to relieve casting stresses.

Laboratory Control

Unremitting control over all phases of production by a laboratory of good standard is necessary. At the Wellington works of Lloyds (Burton) Limited, material from each treatment is sampled so as to enable analysis of the base iron to be conducted and the magnesium and silicon contents of the fully-treated iron to be determined.

Additionally, from each ladle a small block is provided for rapid check on graphite form. The microstructure is further and fully checked by examination of microspecimens cut from the heat-treated test-bars.

Normally, the purchaser requires a certificate of tensile properties and when it is necessary to report tensile strength, yield point and elongation, use is made of a clover-leaf block of the dimensions shown in Fig. 5. Testing of this conventional type, however, which involves sectioning of the test-blocks and machining of the bars, represents appreciable extra expense and in order to reduce the cost and time lag and increase the convenience of routine testing, use is now made of transverse-rupture properties derived from 1-in. square bars tested at 9-in. centres. The test-bars are poured in pairs through a shared block-feeder, as illustrated in Fig. 6. The transverse-rupture-stress values obtained from as-cast bars, provide a reliable index of tensile strength, while the deflections obtained on the annealed bars can reliably predict the elongation values. At least one clover-leaf block test-piece is, of course, poured from every treatment, for exact determination of tensile properties as and when required. All results are plotted graphically to provide a running, readily-indicative record of progress.

Typical Production Castings

Figs. 7 to 13 show some typical medium-weight repetition castings made on moulding machines. These include component parts for the agricultural, automobile and textile industries. Additionally, bigger castings in jobbing and in repetitive quantities are moulded in larger boxes, rammed by hand or on jolt-rollover machines, but these are closed on the jobbing floor and cast separately from the products of the main mechanized unit.

A wide range of castings have been produced successfully by these methods, weighing from a few ounces to 15 cwt. in thickness from $\frac{1}{4}$ to 8 in. and in varying quantities from one off to several thousands.

Conclusion

The practicability of the magnesium process has sometimes been doubted and it has been said that the results reported from earlier work and field tests could not be reproduced consistently under ordinary commercial conditions, and that the production of complex castings to stringent acceptance tests would be extremely difficult, if not impossible. In the main, statements of this type have emanated from persons who were only on the fringe of this development, who have not applied the process as it is taught, or who exercise insufficient control over all phases of the manufacturing procedure.

To those who have a complete understanding of the process, there remains no doubt that castings in spheroidal-graphite cast iron can be made on a commercial production basis, with satisfactory structures and properties, that these can be maintained from treatment to treatment and that castings of exacting design can be made satisfactorily in the new-type iron.

The engineering user has proved to be extremely interested in S. G. iron and it has been found that a host of suitable applications are opening up in which the unique combination of properties exhibited by S. G. iron can be utilized to advantage. The increasing demand for S. G. iron castings and the consequent call on production capacity makes it such that undoubtedly the best arrangement is to equip a separate foundry or a self-contained section of a foundry especially for production of this iron. This enables the manufacture to proceed unhampered by outside influences and particularly allows this thriving infant to be unrestricted by the dominant needs of the adult staple product. This is the course of action that should be followed by those firms which mean to produce S. G. iron in the most efficient and most economical manner. Already developments on those lines have been effected and are in progress or at the drawing board stage.

The development of the material is, of course, still in its early stages, and great improvements lie ahead, a vast fund of ingenuity is being and will continue to be directed to devising improved and

cheaper alloys and other materials, better methods of introduction, etc. That the development is of the greatest practical, theoretical and commercial interest is shown by the stream of papers that have been devoted to the subject over the last three to four years and which continue to appear every month or, more correctly, every week, in all parts of the world.

The Author makes no apology for having added a further contribution to the flood. He hopes that his Paper has said enough to show that in this important development the days of field trials, production of test-pieces and sample castings are passing and those of ever-expanding, ever more efficient and reliable, ever more economical production of castings in spheroidal-graphite iron are here.

Acknowledgments

The Author wishes to express his gratitude to the directors of Lloyds (Burton) Limited for permission to present this Paper and also to those members of the Mond Nickel Company Limited, Development and Research Department whose guidance, assistance and advice has always been so freely given to the Author and his colleagues.

Small Scraps of Scrap

The steel industry thinks in big tonnages when considering its scrap supplies, and steel consumers may also be doing this. Scrap itself, however, is invariably produced in small quantities and small "scraps of scrap" cannot be ignored. This is pointed out in a message which has been sent by Captain H. Leighton-Davies, chairman of the Scrap Committee of the British Iron and Steel Federation, to all members of the Institution of Production Engineers. Support is sought in furthering a drive to secure much more scrap from home sources. In particular, production engineers are asked to encourage their staff and workmen to become "scrap minded." This may entail making a regular inspection of their factories and instructing that obsolete plant and doubtful steel spares should be scrapped and made available for collection. Higher management should take a broad view of the real need for parting with such scrap, irrespective of the cash value that they may obtain at this stage.

While it may be true that there is a considerable quantity of scrap lying around the country, particularly on farms and on local authorities' refuse dumps, it is evident that the greatest tonnage of dormant scrap lies within industry itself. It is in the hope and expectation of recovering this material that Captain Leighton-Davies addresses his appeal to production engineers. Backing the appeal, Major-General K. C. Appleyard, the president of the institution, says that if every engineer will go around his works and mark for disposal everything in the way of iron and steel in whatever form which is not likely to be used or wanted in the next two or three years, old machinery, old buildings, old tools, he will not only help to clear his own works, but will be helping to satisfy an urgent national need.

Clydebank Centenary

Names of renown in Scottish shipbuilding history were recalled recently in Glasgow at a dinner arranged by John Brown & Company, Limited, to celebrate the centenary of the founding of the Clydebank shipyard.

Lord Weir, chairman of G. & J. Weir, Limited, in proposing, with Sir John Craig, chairman of Colvilles, Limited, the toast of "The Clydebank Shipyard—One Hundred Years of Shipbuilding," recounted how the brothers Thomson, after becoming their own masters and starting their first engine shop, in 1851 added the shipyard at Govan to their activities, and remained there until the early '70's, when the Clyde Trust forced them to seek a site farther down the river. By 1883 the entire shipbuilding and engineering activities had been centralised at Clydebank. In 1897 the name of the establishment became the Clydebank Shipbuilding & Engineering Company, and two years later they came to what a Scotsman was bound to regard as a reversal of the natural order of things—a famous English firm from Sheffield crossed the border and took a controlling interest. The inheritance which John Brown & Company purchased was a rich one, for by that time the fame of the yard was well established and it had a range of clients comprising the leading shipowners of the time.

Regarding the personalities who had so successfully guided the destinies of the yard, Lord Weir said that what to him stood out in all the amazing chronicle was the indomitable spirit of those men and their determination that quality, reliability, and efficiency would be their watchword. The THOMSONS, JOHN DUNLOP, SIR THOMAS BELL, that sterling character of strict integrity JOHN PATERSON, W. J. LUKE, SIR STEPHEN PIGOTT, now enjoying his well-earned leisure, SIR DONALD SKIFFINGTON, and today DR. J. M. MCNEILL.

Sir John Craig said it was a fortunate day for Scotland when John Brown's came to Scotland and added their skill, wisdom, and foresight to Clydebank industry. LORD ABERCONWAY, the present chairman of the company, had proved a great leader of a great industry.

Steel Price Complaints

The Ministry of Supply has announced that complaints have been received from building contractors and manufacturers about the prices they are being charged for steel sold to them under the guise of "fabricated" steel. Common expedients in use are the bending of reinforcement rods and the drilling of holes in angles and sheets. Purchasers usually do not need the steel to be thus "fabricated," but they are required to pay very high prices for these simple processes.

The Ministry regards these steels as price controlled. Investigations are proceeding with a view to prosecuting those who contravene the Iron and Steel Prices Orders, when becoming involved in such transactions.

THE MINISTRY OF MATERIALS wolfram-buying agents have reduced their buying price for wolfram to 485s. per unit c.i.f. for standard grade material. The previous buying price ranged from 515s. to 525s. c.i.f., depending on source.

Publications Received

Industrial Diamond Trade Name Index for 1951-52. Published by the N.A.G. Press, Limited, 226, Latymer Court, London, W.6. Price 3s. 6d.

This 64-page booklet lists the trade-marks in this particular field for the whole world. Included in the list are also the names of firms who trade in industrial diamonds. It is a very useful publication for those interested in this very virile industry.

Office Management—The Tasks of Getting Things Done. Published by the Office Management Association, 8, Hill Street, London, W.1. Price 7s. 6d.

This is a Conference Report and, like most others, is pretty dull reading. Unlike technical discussions there is a complete absence of figures. Thus the whole of the arguments are merely expressions of opinion. It is just another case of conditions varying so materially from one firm to another that there is really very little that one can get one's teeth into.

Information Sheets Nos. 14, 48 and 49. Issued by Foundry Services, Limited, Long Acre, Nechells, Birmingham, 7.

These three pamphlets deal respectively with high-tensile brasses, nodular cast iron, and malleable cast iron. They all follow the same pattern by giving details of composition, properties, processing, and the like, and include a few words on the application of the firm's own products. The one on nodular iron would perhaps have been the better for delaying as it is still too early to write authoritatively on some important phases of its production. This is confirmed by the very phrasing of the letterpress. The data sheets covering malleable and the high-tensile brasses are much better, as they cover well-established techniques. These publications are available to our readers on writing to Long Acre.

Technical Brochure. Published by the Tyseley Metal Works, Limited, Birmingham, 11.

This 70-page brochure places reliance on the dissemination of technical knowledge as a means of familiarising the reader with the services rendered by the company to the non-ferrous foundry industry. The lengthy introduction by Mr. G. W. Booth, epitomised, indicates that through the use of the ingots manufactured by the company, any intelligently-operated non-ferrous foundry can, with reasonable certainty, turn out castings complying with standard specifications, whereas if such foundries rely on the use of miscellaneous scrap bought in the open market, they will sooner or later—probably sooner—run into trouble. The reviewer stresses the words "intelligently-operated" for the regards the brochure as being an *aide memoire* to manufacturing intelligence. After giving a short review of the history of the non-ferrous casting and of the ingot industry, sections of the brochure are devoted to metallography, general foundry notes, and defects, thereafter each of the standard alloys—aluminium, bronze, brass, manganese-bronze, silicon-bronze, nickel-silver, tin, nickel and lead bronzes, phosphor-bronze, bell-metal and light alloys are dealt with. The really technical illustrations are exceptionally good, but a few of the illustrations of the works could be deleted without detriment to subject matter covered. For example, a picture of a chemical balance neither edifies the reader nor embellishes the text. The reviewer is quite satisfied that his readers engaged on the manufacture of copper-alloy castings will derive real benefit from perusal of the brochure. It is assumed that it is available on writing to either Balfour House, Finsbury Pavement, London, E.C.2, or the Birmingham works.

Book Reviews

Mechanical World Year Book, 1952. Published by Emmott & Company, Limited, 31, King Street, Manchester, 3. Price 3s. 6d. net.

This issue has an innovation in that it carries an eleven-page article on the subject of patents. Otherwise it closely follows the pattern of recent years. The book has now reached its 65th year of publication, which, in itself, is testimony of its popularity.

The Manufacture of Iron and Steel—Vol. II, Steel Production. By G. Reginald Bashforth, F.I.M. Published by Chapman and Hall, Limited, 37, Essex Street, London, W.C.2. Price 45s. net.

In this progressive age, knowledge and design of steelworks plant and processes is constantly being extended, whilst the historical side remains static or nearly so. Thus any Author, having in mind the provision of a text-book for students, is faced not only with the problem of selection of material for inclusion, but also with a clear separation of the obsolete and current usages. It is suggested that the historical side of steel-making could well have been assembled and printed as a first chapter. This would enable the Author to eliminate Chapter 13 which outlines the production of "Blister, Shear and Crucible Steel," which by and large are to-day only of historical interest, or at the best of passing interest to the student. The chapter on electric furnaces suffers from the inclusion of the historical—the reviewer has the Kjellin furnace in mind—in such a way that the student is left somewhat hazy as to what is modern and what has passed into obsolescence. Now, the chapter on the baby Bessemer contains nothing but really up-to-the-minute information and is in advance of any other text-book known to the reviewer. To revert to the chapter on electric furnaces, there is a confusing anomaly. On page 227, it is stated that "When melting cold scrap charges the power consumption may approximate 600 k.w.h. per ton, falling to 450 k.w.h. per ton in larger furnaces." Yet a log sheet of a 15-ton furnace set out in detail shows the consumption to be of the order of 763 k.w.h. per ton. Chapter 4 opens with the statement that "two young German engineers called Siemens were conducting experiments which, although remote from the subject at the time, eventually led to the beginning of the open-hearth process." The reviewer always understood that these inventors were British, at least Hadfield, in his book, places Sir William Siemens amongst the great British inventors in the metallurgical field. The chapter on instrumentation is infinitely better than one on pyrometry, which the classical works almost invariably included. The one on refractories, too, is a useful innovation. Despite these minor criticisms, the book can be recommended with mental reservation for use as a text-book by metallurgical students. V. C. F.

Scottish Light Castings Wages

Clerical workers employed in the Scottish light castings industry are to receive increased rates of pay as the result of negotiations which have recently been completed. Announcing agreement arrived at in December, the Clerical and Administrative Workers' Union state that male clerical workers who have attained the age of 21 years and over will receive an increase of 11s. a week. Female clerical staff of the same age will receive an additional 10s. a week, while proportionate increases have been agreed upon for juniors between the ages of 15 and 20. In addition, an improved overtime clause has been included in the agreement. Increases, which principally affect the Falkirk, Bonnybridge and Larbert districts of Scotland, will take effect as from December 3.

Defects in Enamelling

I.V.E. Discussion at the Birmingham Conference

At the annual meeting of the Institute of Vitreous Enamellers a session was devoted to a discussion of defects which occurred in enamelled ware, some photographic examples of which were displayed for inspection on the walls of the meeting room. The following is a slightly abridged report of the proceedings.

MR. S. HALLSWORTH (Chairman of Council) presided, and introduced Mr. A. Biddulph (chairman of the "Atlas of Defects" sub-committee of the Institute), who opened the discussion.

MR. BIDDULPH recalled that earlier in the year the Technical Committee of the Institute had received a suggestion that it would be a good thing to know what were the defects which occurred from time to time in vitreous enamelling and how to overcome them. Attention was drawn to an "Atlas of Defects" which the ironfounders had produced, containing photographs of typical faults in castings, accompanied by letterpress regarding possible causes, possible cures and recommendations, and it was decided that the I.V.E. should have a sub-committee to deal with the matter.

The sub-committee was formed in April, 1951, and consisted of Mr. S. E. A. Ryder, Mr. J. H. Gray, Mr. K. Williams and himself. So far, they listed common defects and the generally-held ideas regarding their occurrence and cure. That list had still to be re-examined, corrected and amplified before any publication was made. In several enamelling shops, examples of some of the faults had been selected. Those examples were not intended to cast any reflection on the works from which they came or on the enamels used. In some cases, examples apparent to visual examination, were not suitable for photographing. Therefore, in some cases examples of faults suitable for photographing and exhibition had been produced deliberately. He pointed to one such which was exhibited at the meeting, an example of crawling, which was probably far worse than would be obtained by accident. Other manufacturing faults had been magnified and exaggerated for photographing. Many of the faults occurring on enamelled plates were minute from the point of view of photography, even though they loomed large in the eyes of inspectors. For instance, to show to advantage a good example of a plate with a little perrit scale measuring perhaps $\frac{1}{16}$ in. it had to be magnified. Another example exhibited was a piece of cream panelling, and beside it was a photograph, at 10 to 20 times the actual size, of the defect contained.

Defects Enumerated

MR. BIDDULPH then discussed each of the exhibits in turn and pointed out the characteristics of each. In addition to many examples of defects in sheet-iron enamelling, which, said Mr. Biddulph, was more easily controlled than cast iron, were included an example of a bad "boil" due to the presence of a very heavy lug on the back of a casting, where a photo-micrograph of the metal in the same position on a similar casting showed a very open and coarse structure. In another case, a cast plate having been sprayed, the operator had released the trigger of the gun, so that the air was cut off, but the enamel was not cut off, and the enamel had been dripping while the gun was brought back over the plate. An example of a piece of cream panel was shown. The ground coat had appeared to be satisfactory, but, when the cream cover coat was fired, a lamination in the metal had expanded to give a blister. Unevenness of ground coat in a sheet-iron cylinder was also used as an example. The cylinder was dipped in the ground-coat and fired; but the ground-coat was watery and had drained unevenly, so that there was probably a thickness of 0.004 in. in some places and about 0.001 in. in others. Yet another example showed bad dimpling in the centre of a ground-coated plate and finally, a cream panel was submitted by Mr. E. R. Dunning for examination by the meeting. It was in the condition as received from the makers and showed cracks on diagonal corners and cracks on the radius from the face to the side, and was typical of some of the panels received.

Several of the examples displayed would have to be photographed again and Mr. Todd had put the sub-committee in the way of effecting improvements and of getting technical help in the photography.

Gas Appliance Defects

MR. E. R. DUNNING from the user's point of view first made the general point that those who bought appliances did not see very much of the sort of defects which had been illustrated, for obviously the articles exhibiting such defects would be thrown out by the inspectors of the makers of the equipment.

He was particularly troubled nowadays by the occurrence of chipping, which was assuming quite alarming proportions. In the North Thames Gas Board, investigations had been made since about 1949, in dealing with something like 150,000 pieces of equipment a year. They were in touch with all the other sections of the nationalised concerns and chipping was very general. Defects averaged something like 15 per cent.; in the equipment received from some makers there was up to 25 per cent., whereas in that from other makers the figure was as low as 5 per cent. Defects could subsequently develop in use but the main trouble was with defects which became evident up to the time at which consumers actually accepted household gas appliances.

Defects in Enamelling—Discussion

The total defective gas appliances must come to more than 100,000 a year. The cost of replacing a part in a factory was just the cost of the part, but when those parts were scattered throughout the country, at consumers' houses, and fitters were called perhaps two or three times, a great deal of expense was involved. The manufacturers might replace the defective parts, but that was not by any means a solution. It was felt that the troubles experienced were due to a number of causes. With chipping, for instance, the enamel was often in a state of strain and would show defects at some time or another. Thickness was also a major cause of trouble, and Mr. Dunning suggested that if only the manufacturers would throw out the thick enamel from the start it would be more satisfactory. On a number of occasions a manufacturer had sent an inspector to travel with the goods; the result was that the goods were not then damaged in transit, possibly because the driver of the vehicle knew of the inspector's presence. Improvement could be effected by placing packing material wisely. In the consignments from one manufacturer, there was trouble with crown trays. That was found to be because they were packed in separate bundles, and the carman had used the bundles as wedges between rows of cookers in order to pack the whole of his load tightly.

Design and Assembly as Causes

MR. W. J. PERKS suggested that a lot of defects were due to faulty design of the articles, and also that a major proportion of the chipping arose from carelessness in assembly. He expressed the view that not one designer in a hundred submitted designs to the enamellers in order to ascertain whether those designs were suitable for enamelling. With regard to assembly, he urged that a washer, preferably of asbestos, should invariably be used between a screw-head and an enamelled surface.

MR. S. BARKHOUSE'S remedy against chipping was to use cast iron for components. The enamel could be only as strong as the metal itself, and if cookers were made of sheet metal one must expect a good deal of chipping.

MR. A. B. KENT, referring to some of the troubles on pressings that were illustrated, expressed the view that they would not occur if Armco ingot iron were used. He imagined that most of the troubles on pressings occurred on those pressed from metal which was never intended to make anything but a flat sheet.

Potential Usefulness of the Atlas

MR. S. E. A. RYDER felt it would be useful if members could indicate whether they felt that defects could be adequately presented photographically, on the lines of some of the photographs exhibited, or whether it could be done more usefully in some other form.

MR. J. H. GRAY suggested there were three angles from which to look at the problem. First, there were obvious troubles, such as most enamellers would recognize. Care must be taken to ensure that the proposed Atlas was not presented in such a way that, if it got into the hands of people who knew nothing of enamelling, they would telephone the "cause" of any particular trouble. Secondly, there were defects which were found after the work had left the enamelling department. Thirdly, there were troubles experienced in the enamelling shop about which the customer never heard. Those troubles had to be overcome, and would be difficult to explain in an Atlas of Defects. It was as well to make clear just what was being attempted.

MR. BIDDULPH said the first requirement in an Atlas was definition, to show what a defect was. Subsequently, possible causes could be suggested and recommendations made for preventing or avoiding it. The sub-committee would like approval from the meeting that they were following the right lines.

MR. D. MILL felt that photographs of simulated faults did not mean a great deal. Photographs of actual faults which were occurring, however, could be useful.

MR. BLACKBURN agreed; having seen the faults that were portrayed, he said that most of them looked very much as they were shown in the photographs.

MR. BIDDULPH pointed out that in the course of production he had seen all the faults portrayed in the photographs. He appreciated that no-one would wilfully bend a plate, bend it back again and spray white on to it, but he had seen faults arising from that cause. In the same way, one would not knowingly fire "biscuit" when it was damp; but it had been done, and faults arose from it.

As to the simulation of faults, he pointed out that faults arose in the production of jobs which were essential production. Some could not be held back so that the sub-committee could photograph them. Secondly, by simulating defects on plates of convenient size, they were handier for photographing than were large pieces. If anyone considered there were causes of particular defects other than those suggested, he would be glad to hear of them, so that they could be included in the notes in the Atlas.

Less-obvious Causes

DR. B. NIKLEWSKI, speaking of faulty groundcoats, said they might be due to wrong set-up, too-low specific weight, too much water (even though correct to specification), or to the coating not being drained properly. There was also the problem of how many ounces should be used per sq. ft. of area. Faults such as ground-coats not being properly set were quite common in the industry. There were problems of "copper-head," "crawling," and so on. All those troubles were bothering many people in the industry, and they were looking for more advanced information as to the cures.

MR. MILL felt sure that the faults portrayed appeared in many parts, but that there were many more complicated ones. At least a start had been made, and perhaps "bigger and better" faults would be dealt with as time passed.

MR. J. H. GRAY said the whole consideration of faults was tied up with the question of control. After visiting various enamelling establishments, he

realised that money was saved by engaging a man who could control enamelling processes, without being worried about production. A control man going around checking thickness and acid solution, watching the firing, and so forth, could prevent trouble arising; and minor difficulties could be eradicated before they developed seriously.

Chipping

MR. A. H. SYMONDS suggested that chipping was possibly the most important fault and gave the enamelling industry a bad name. In view, therefore, of Mr. Dunning's remarks about the amount of chipping he had recorded, he felt that the value of the sub-committee's work would be much enhanced if they could give an analysis of all the forms of chipping discovered, whether chipping was occurring on sheet iron or cast iron, whether the wrong enamels were used for jobs, whether there was poor design, bad enamelling, bad assembly or any other cause.

MR. MILL, recalling Mr. Dunning's references to consumers' complaints concerning faulty enamelling on gas appliances, said use of wire wool was sometimes recommended for cleaning cookers, but no enamel would withstand that sort of treatment.

MR. S. BARKHOUSE asked somewhat naïvely whether the desire was to satisfy the consumer or the vitreous enameller. Whilst he himself was a vitreous enameller, he did not believe in taking the line of least resistance—in his view, represented by enamelling on sheet iron! In the interests of consumers and for the reduction of complaints, he advocated the cast-iron job.

MR. DUNNING first pointed out that the 15 per cent. of complaints which he had mentioned had nothing to do with wear in use; they were complaints about chipping which the customers saw before they paid for the appliance. It was that 15 per cent. of chipping trouble which worried the gas industry very much more than other troubles such as poor acid-resistance, which, might result in complaint in the course of time. At the moment, chipping and fish-scaling were placed in the same category.

The problem of cleaning was partly a question of the design of the appliances. Some advocated cleaning down with hot, soapy water; but this was not really adequate. Pre-coating enamelled ware had been tried so that cooking splashes could be removed easily. All sorts of ideas had been tried in a rather *ad hoc* way.

As to the question of comparing cast and sheet iron, he suggested that a gas cooker had a tendency to last too long, so that the design was out-dated before the appliance was worn out. People were inclined to compare the old cast-iron gas cookers with what the electrical people could offer, rather than to compare the best that the gas industry could offer with the best in the electrical industry. The question of price was important, and he had a feeling that in the end the sheet-iron cooker would prove cheaper than the cast-iron cooker, when finished in the colours which consumers now asked for.

MR. BIDDULPH asked Mr. Dunning if it had been meant that 15 per cent. of cookers despatched had a chip somewhere, or that chipping covered 15 per cent. of every piece delivered.

MR. DUNNING said Mr. Biddulph's first suggestion was correct.

MR. BIDDULPH was not so perturbed by chipping as if he received a complaint about fish-scaling. Once fish-scaling started, one never knew how far it was going. He asked Mr. Dunning what proportion of the chipping was fish-scaling.

MR. DUNNING replied that, recently, one manufacturer had had quite a lot of trouble with fish-scaling, but it had now been overcome. Percentages of defects varied between manufacturers and from time to time. Whilst accidental damage could arise if the enamel was struck sufficiently hard, much chipping was not so caused. Chipping occurred at bends and much depended on the iron underneath, on the general question of annealing, etc. Compared with pre-war, there were more components on a cooker to-day, which tended to give rise to increased trouble.

American Ideas

A number of American firms held that the way in which to make a cooker was to have the cooker welded in one piece and then enamelled. One difficulty was that, if such a job did chip, the whole had to be replaced.

MR. BIDDULPH said Mr. Dunning had given a lead when he had said that in a few pieces made by one manufacturer trouble sometimes occurred, and it would start in the same place on other cookers of that make. That confirmed Mr. Perks' suggestion that a lot of the chipping was tied up with design and faulty assembly.

Delayed Defects

MR. C. P. STONE congratulated the sub-committee on the collection of faults which had been presented, and supported Mr. Mill in that a lot more would be forthcoming and could usefully be added.

As one who had spent many years in the cooker trade, he expressed sympathy with Mr. Dunning, who, surprisingly, had not used the term " delayed defects," which summed up his trouble. He asked Mr. Dunning what was the percentage of delayed defects experienced to-day as compared with pre-war days. We were now living in an age of low-temperature enamelling, probably we were not giving ground-coats so much firing as in years gone by, so that the ware would be out of the plant before defects could develop. Examination of the plate circulated among members by Mr. Dunning, showing a defect in the corners, was, in his opinion, a definite hairline, hence the crack, which could be associated with a number of causes and most probably aggravated by the ground-coat being a little too heavy at the point where it failed.

MR. DUNNING replied that in the course of recent investigation a careful inspection was made of every part that came into the stores, as distinct from the normal inspection of a proportion only. All the appliances which were found to be damaged, about 10 per cent., were rejected. Those that passed inspection were delivered to consumers, and 5 per

Defects in Enamelling—Discussion

cent. of those became the subjects of complaints later. He had the impression that delayed defects were present, and that a slight bump or time only was required to cause them to develop. In warehouses, particularly during the silence of night, one could hear " ping," " ping," " ping," indicating that chipping was occurring. Finally, he said he was all in favour of the issue of an Atlas of Defects.

MR. A. FIFIELD welcomed Mr. Dunning's contributions which should give a lead to the sub-committee in dealing with the prime faults, because faults which occurred on consumers' premises were those that were most damaging; faults which were detected in the shops were domestic troubles. The fish-scaling defect could be photographed, but to describe the causes was quite a difficult matter, although many of the faults portrayed at the meeting were capable both of photographing and explanation.

Increased Chipping

MR. PERKS, discussing chipping, said, years ago a stewpan was straight-sided; subsequently, tapering of the sides had reduced chipping very much, by removing sharp angles.

MR. DUNNING said that definitely there was a very big increase in delayed chipping now as compared with pre-war. How far that was due to appliances having more awkward shapes than formerly he did not know. The use of the cover-top design which had been brought to the meeting for examination had increased enormously, which obviously brought more defects in its train. Even discounting extra parts which nowadays were featured on a gas-cooker, he would say that the number of defects occurring was very much greater than before the war and was largely a question of design. A consumer nowadays who had to pay a high price for a cooker would examine it as with a microscope in order to ensure that it was perfectly sound, whereas, pre-war, a hired apparatus would not be given so much attention.

Unfair Comparison

MR. S. E. A. RYDER said the makers of all appliances were being pressed to supply them finished in white or cream. This presented no difficulty on the correct quality of steel, but many makers, owing to the sheet-metal position, were forced to apply white or cream finish on steel which was not suitable. In order to keep down the number of rejects, extra coats were being applied on a large proportion of the pieces. This extra thickness, of course, increased the chance of chipping. The pre-war range of cookers to which Mr. Dunning referred, were finished in fairly dark mottle grey, and the number of rejects might well only be 5 per cent. as mentioned, but it was not fair to compare these cookers with the cream- or white-finished appliances now being supplied.

Repeating his earlier request that more of the members should express their opinions as to whether the presentation of defects photographically would be a good thing, he said that the proposed Atlas would be expensive to produce if it were done properly; there was no point in spending possibly some hundreds of pounds if there were any doubt of its being of help to members.

MR. TODD was of the opinion that the sub-committee was definitely working on the right track. He added that the pre-war gas cooker was hardly comparable with that of to-day, because, apart from the fact that the pre-war cooker was finished in grey mottle, it had also a cast-iron top and door.

MR. STONE endorsed the suggestion that Mr. Dunning should invite the sub-committee to visit him, for the result of such a visit would be to guide their further activities.

MR. A. R. PARKES, on the question as to whether the production of an Atlas of Defects was worthwhile, pointed out that the Institute of British Foundrymen had published two editions of their Atlas, at the request of members, the second being a much enlarged version of the first. It was a really creditable effort. The Americans and the Italians had done the same thing; it all proved that other bodies found that sort of publication useful. A remarkable feature revealed in the discussion that afternoon was that the sub-committee could successfully simulate defects. Founders had tried to do that on a number of occasions, but invariably managed to produce good castings!

Publication Envisaged

MR. BIDDULPH, asking the meeting to endorse the proposal to produce an Atlas, said the pictures would measure probably 6 by 5 in., similar to those displayed at the meeting. Underneath each picture or on a separate page there would be notes indicating possible causes of the defect illustrated, and recommendations on how to avoid it. In the case of ripple or orange peel, for example, the causes were an indication of the remedy. In another case, however, where there might be two or three possible causes which were not self-explanatory, the sub-committee would indicate in perhaps 20 or 30 words the methods whereby the fault might be avoided. The book would contain probably 40 or 50 items, each of which would be illustrated by a photograph, some probably having two photographs.

MR. S. HALLSWORTH reiterated that the Council of the Institute must have a decision as to whether to go ahead with the Atlas.

MR. BARKHOUSE, although he felt that he was in a minority, considered the publication would be a waste of money.

MR. GRAY was in agreement that the proposed Atlas was essential. If a worthwhile volume was produced, it would be successful; if it were to be skimpy, it would be better to leave the project alone. Faults might be classified in sections, the first dealing with faults such as were shown at the meeting, the second dealing with the more complicated problems which were not easy to illustrate, and the third concerned with delayed rejects, *i.e.*, those occurring when the enamel-ware was in the hands of the customer.

MR. BLAIR ALLAN did not think there was a single fault displayed at the meeting which had not been covered in a monthly series of articles, with photographs, in the Press during the last three years. Therefore, he suggested that it would be a waste of money for the I.V.E. to produce the proposed Atlas. The information was already available cheaply.

(The meeting was asked to indicate by a show of hands whether or not to proceed with the preparation of the proposed Atlas, without committing the Institute on matters of detail, such as the size of the Atlas, and so on. A large number of the members voted in favour of proceeding, there being only two dissentients.)

Defective Cooker Top

MR. MILL, in response to a request for further comments on the cooker top exhibited to the meeting, said there was no information on what had happened in service, and the members had not seen the cooker. He suggested, however, that the enamel was too thick.

MR. BLACKBURN suggested that, if the producers had a check and a limit on ground-coat thickness, such a defect would not have occurred. The ground-coat appeared to be about 0.012 in. thick.

MR. H. LAITHWAITE said the company in question imposed a ground-coat check and the maximum thickness was 0.006 in. One could not just say that the ground-coat or cover-coat was thick, and put that forward as the reason for cracking. If such a component were placed over the edge of a table and if a little pressure were applied, one would produce a perfect imitation of that fault. Therefore, he suggested it was due to mechanical stress applied to two opposite corners; it seemed that the tensile stress on the enamel had produced a hair-line crack and to some extent the enamel had come off.

MR. BIDDULPH next drew attention to a crown plate containing dimples, which was also exhibited at the meeting, and asked for comments.

MR. H. CLEWES suggested that the defect was due to furnace dust, possibly dropping on to the load as it entered or left the furnace, owing to the movement of the door. He had known that to occur.

MR. MILL agreed that anything falling on the plate could cause the trouble.

MR. CLEWES commented that if the furnace man was on the look-out he would remove the dust from the surface of the plate prior to firing.

Other Defects

MR. BIDDULPH agreed that in that particular case dust was the cause of the trouble. Presenting two other samples, he said one was an illustration of the difficulty of the enameller to put his enamel on even the best iron to produce a good-quality job. The other was a shaped-piece showing a surface defect.

MR. CLEWES said the defects in both samples were due to having the wrong type of " set " in the enamel. The firm in question was using sodium nitrite with that particular enamel, and it was neither under-set nor over-set. But by using a different type of set, sodium aluminate, the difficulty apparently was overcome

(*Concluded at the foot of col.* 2)

Sand Cushions Help in Producing Better Castings

By " Trouper "

When a considerable amount of core-drying shells are wanted there is always a certain amount of tension in the patternshop before the first pattern is made in metal. The usual procedure is to make a master-pattern in plaster and, when one is dealing in castings with a length of six to eight inches, this naturally becomes a very fragile model. At times, the writer has made as many as fifty castings without breaking a plaster pattern of this nature, but patternshops are usually satisfied with one casting. Before standing the plaster pattern on a board for moulding, a layer of sand at least an eighth of an inch in depth should cover the board. For this, a fine sieve is necessary to ensure that the sand cushion is soft and free from grit. The mould is then made in the usual manner but when turned over it is the bottom board which holds the mould together and not the hard ramming, and a cushion effect is provided by the fine sand layer.

FIG. 1.—*Type of Spray Runner Recommended for Thin-section Castings, such as Nameplates.*

Another instance where a sand-cushion is necessary is when a thin wooden pattern is sent into the foundry; this may be a name-plate or perhaps a pattern for a core-drying plate. After a pattern of this nature has been made, the patternmakers like to send it in the foundry and have a casting made from it straightaway. This is quite understandable, as a thin wooden pattern will warp if left overnight. If the foundrymen are on other work at the time, this is not always possible and it is then that a sand-cushion is necessary for, when a warped pattern is placed on a board it does not lie flat, and, as the moulder rams his box of sand, the pattern is continually springing. If there is any lettering on the pattern it is advisable to mix oil-sand with the facing sand; this keeps any loose particles from washing-in with the metal.

The runner should be so designed that no metal is allowed to enter the mould directly it is poured into the down runner. From experience, it is found that the type illustrated in Fig. 1, gives the best results.

Joint Iron Council Representatives

The Council of Ironfoundry Associations has renominated its present representatives on the executive committee of the Joint Iron Council to serve for a further period of twelve months. The C.F.A. representatives are as follow:—Mr. N. P. Newman (chairman, C.F.A.); Mr. J. D. Carmichael, Mr. F. D. Ley, and Mr. H. V. Shelton, vice-chairmen, C.F.A.; Mr. J. E. Bennett, Mr. D. G. Bisset, Mr. A. Firth, Mr. V. Jobson, Mr. R. E. Nutt, Mr. A. E. Pearce, Mr. S. H. Russell, and Mr. A. Watson. Mr. F. Scopes has been re-elected as president of the Joint Iron Council, and Mr. Newman has been re-elected as vice-president.

MR. BIDDULPH, at the conclusion of the discussion, invited members to indicate the life-history or the rate of occurrence of the defects which were sent as samples to the sub-committee.

Fuel Efficiency Pamphlet*

Convinced that there is little hope of increasing coal output substantially in the near future, and that we must therefore make better use of the supplies which are at our disposal, Mr. G. D. N. Nabarro and Mr. C. J. M. Alport, two Conservative M.P.s, have produced a pamphlet which they describe as "an approach to a fuel efficiency policy." The best prospects of fuel saving are, of course, in industry and Mr. Nabarro and Mr. Alport have constructive suggestions to make to secure that saving. First, they insist that every new power house must use its latent-heat capacity for district, industrial, or domestic heating schemes. Industrial steam must be made to serve at least two, or possibly three, purposes—power, processing, and heating—which it is claimed can yield up to 70 per cent. efficiency instead of the 20-25 per cent. efficiency of existing methods. Boilers, stoking, steampipe lagging, and installation must have special attention, and boiler men and stokers should be enabled to reach a higher standard of skill. Steam, oil-driven, and other generators for making "local" electricity supplies, independent of the grid, should be encouraged, and the skeleton fuel-economy advisory service of 175 technicians working under the direction of the Ministry of Fuel and Power should be augmented by a panel of private fuel consultants who would co-operate on a five-year plan to overhaul all coal-burning equipment in their respective towns or areas.

Finally—and this is a point which the Authors underline—the fiscal weapon must be used by the Government to the utmost. All fuel-economising plant installed in industry, they suggest, including plant for electricity generation, should be certified on installation by an appropriate representative of the Ministry of Fuel and Power, and, if eligible, admitted as a charge by the Inland Revenue when calculating the liability of the company concerned for taxation.

The Authors of the pamphlet also believe that there is wide scope for fuel economy in the home. They insist that steps be taken to ensure that all new houses incorporate up-to-date standards of space and water heating. If necessary this should be the subject of legislation. A system of incentives should be provided to speed up the introduction of improved types of grates and other appliances into existing public buildings and private houses. Steps should be taken to eliminate certain space- and water-heating appliances from the market, if possible by agreement within the manufacturing industry. A major publicity campaign in which the Government, local authorities, and voluntary organisations co-operate, should be undertaken to bring home to the domestic user the importance of fuel efficiency.

* The pamphlet, entitled "Make Coal Work Harder," is published by the Conservative Political Centre, 6, Victoria Street, London, S.W.1, and is priced at 6d.

British Industries Fair

The exhibition halls at Castle Bromwich, Earls Court and Olympia, will again be used to house the 1952 British Industries Fair, which opens simultaneously in London and Birmingham on May 5 and continues for eleven days. As usual, predominantly heavy industry will be shown at Castle Bromwich and consumer goods at the London sections; the whole will include the production of nearly 3,000 firms in 90 trade groups. The general public is admitted on only two days of its run; for the rest of the time entry is restricted to home and overseas buyers on production of their business cards. Everything possible is done for the comfort and convenience of buyers from overseas, and the massive B.I.F. catalogue, which has a permanent use as a guide to suppliers in Britain, is printed in many languages.

Productivity Reports

As frequent inquiries are received about Productivity Reports, below are printed lists of those applicable to the industry, with information as to their availability:

	s.	d.
Materials Handling in Industry	2	6
Materials Handling in Industry (pamphlet)		6
Packaging	2	6
Grey Ironfounding	3	6
Simplification in Industry	1	0
Simplification in British Industry ...	1	0
Management Accounting	2	0
The Brassfoundry	7	6
Freight Handling	2	6
Non-ferrous Metals	4	6
Productivity Measurement in British Industry	2	0
Valves (Steel, Iron and Non-ferrous) ...	3	6
Metal Finishing	3	6
Training of Operatives	3	0
Training of Supervisors	2	6
Universities and Industry	2	6
Education for Management	4	6
Saving Scarce Materials	2	0

The following Reports are out of print:—Steel Founding and Steel Founding (extract).

The following Reports are forthcoming:—Zinc and Aluminium Die-casting; Iron and Steel; Machine Tools (Wood-working); Inspection Methods and Organisation; Production Control.

Reports may be obtained from the Anglo-American Council on Productivity, 21, Tothill Street, London, S.W.1.

Safe Use of Portable Electric Tools

Speaking on "Safety in the Use of Portable Electric Tools" to the Incorporated Plant Engineers, Glasgow centre, at a recent meeting, Mr. J. L. Wood, regional safety officer, British Electricity Authority, Portobello, said that the last war brought about a considerable increase in the use of such tools in industry. Most of these were used in factories and workshops where they operated within a more or less prescribed area, but in an increasing number of cases the tools were being taken to the job instead of the converse. It was difficult enough in well-regulated factories to ensure that tools of this kind got the careful treatment they needed, and it was not difficult to imagine that their more widespread use in other, perhaps less-ordered, work-places raised further problems for the maintenance engineer. It was probably true to say that few appliances had to operate under such adverse conditions.

Out of a total of 161 fatal electrical accidents reported by the Factory Department of the Ministry of Labour in the past five years no fewer than 57 were associated with the use of portable electric machines, handlamps, flexible cables, plugs and sockets. Mr. Wood referred to the various types of tools and the methods by which they should be connected, protected, and handled. Adequate maintenance, preventive rather than corrective, was, he said, one of the best safeguards.

Abrasion and Wear of Materials

The British Society of Rheology announces that a conference on Abrasion and Wear of Materials will be held on January 4, in the Physics Lecture Theatre of the Polytechnic, Regent Street, London, W.1, opening at 10.15 a.m., with a further session at 2.15 p.m. Admission to the conference will be free and without ticket.

Corrosion of Buried Metals*

Points from Discussions in London

Opening the recent symposium on the corrosion of buried metals, the chairman, Sir Charles Goodeve, said that water mains presented the greatest corrosion problems; some 100,000 miles were estimated to be under risk in this country in 1949, with another 25,000 miles of new mains under consideration. The report of the Ministry of Health Departmental Committee on the Deterioration of Cast Iron and Spun Iron Pipes, published in 1950, had stressed the need for further research. B.I.S.R.A.'s sub-committee on the Corrosion of Buried Metals had been formed in March, 1950, and was entrusted by the Minister of Health with the task of carrying out the research recommended in the Departmental committee's report. The sub-committee included representation of all the interests concerned—gas, water, engineering, non-ferrous metals, pipe-manufacturers, etc., under the chairmanship of Mr. L. C. Whiskin, distribution engineer of the Metropolitan Water Board.

Six Papers, constituting a general survey of existing knowledge on the subject, were presented:—"Tests on the Corrosion of Buried Iron and Steel Pipes," by J. C. Hudson and G. P. Acock; "Investigations on Underground Corrosion," by K. R. Butlin, W. H. J. Vernon and L. C. Whiskin; "Cathodic Protection," by K. A. Spencer; "Cathodic Protection of Buried Metal Structures," by R. de Brouwer; "Corrosion of Buried Copper and Ferrous Strip in Natural and Salted Soils," by the British Electrical and Allied Industries Research Association; and "Tests on the Corrosion of Buried Aluminium, Copper and Lead," by P. T. Gilbert and F. C. Porter.

Buried Pipes

Dr. J. C. Hudson, head of the corrosion laboratory of the British Iron and Steel Research Association, gave a brief survey of the events leading to the research described in the first Paper, and Mr. Acock described the interim results it contained. Three sets of steel and cast-iron specimens covering a wide range of bare and coated ferrous pipes, had been buried in four typical British soils in 1944, and a fifth set in made-up ground. The soils at the five sites were salt marsh, London clay, moist neutral clay, Keuper marl and cinders, respectively. The first set from the four and the single set from the fifth station had been examined after 5 years' burial. For bare pipes, differences in the aggressiveness of the soil were more important than differences in the material of the pipes. It appeared that differences that had been reported in the resistance to corrosion of spun- and vertically-cast iron pipes had been rather due to differences in wall thickness than to any other factor, the former type of pipe being up to one third thinner for equal mechanical properties.

Coatings

While it was too early to draw firm conclusions from the behaviour of the various coatings, it might be observed that a zinc coating of 2 ounces per foot protected the specimens over the five years except in made-up ground of ashes where corrosion was heavy. A $\frac{1}{4}$-in. thick bitumen coating on steel tube was almost perfect at this site, but a thin hot-dipped coal-tar-pitch coating, 5 thousandths in. thick, on cast-iron pipe, had failed. Protected specimens were removed from only one other site, in the Keuper marl, where the bitumen coating was intact but the coal-tar-pitch coating showed signs of failure. Vitreous enamel on cast iron was in perfect condition at this site, but a stoved phenolic-resin coating on steel had failed because of its thinness.

Almost three years after laying, the main was examined. The portion protected with a standard 0.005-in. hot-dip coal-tar enamel bath (the Angus Smith solution) was badly graphitized. Bitumen sheathing $\frac{1}{8}$ in. thick, however, gave adequate protection, as did surrounds of good quality concrete or gravel. Further trials were now in progress here and at Willesden.

DISCUSSION

DR. W. F. HIGGINS (Magnesium Elektron, Limited) questioned the value of tests using short lengths of pipe. The service pipe, passing through various soils, would corrode only in cases where it became anodic. It was significant that the specimens shown by Dr. Vernon, cut from long lengths of buried pipe, were much more severely corroded than Dr. Hudson's specimens which had been buried as short lengths. Dr. Hudson's specimens might give an indication of the behaviour of iron and steel when buried under the conditions he described, but would not afford an indication of the behaviour of pipelines. A most important remark in Mr. Acock's address was that it appeared that the nature of the ground was of greater consequence than the type of metal.

MR. W. G. WAITE (F. A. Hughes & Company, Limited) supported Dr. Higgins's contention, and thought that perhaps too much stress had recently been laid on the part played by bacteria in corrosion and more stress should be laid on the cell mechanism that led to it. Discussing the protective coatings tested at the Chemical Research Laboratory, he commented that a hot-dipped coating was permeable and would break down if once rusting started. But it would remain useful for a long time if rust could be prevented from starting. Bitumen was very vulnerable to damage by stones; concrete surrounds lacked flexibility and raised the danger of concentration cells again. Gravel needed good and consistent drainage to be effective and in fact

* Symposium on the Corrosion of Buried Metals held by the Iron and Steel Institute in conjunction with the British Iron and Steel Research Association and the Corrosion Group of the Society of Chemical Industry in London on December 12, 1951. Paper reported in the JOURNAL, December 20, 1951.

usually became choked. He expressed surprise that no attempt had been made to test cathodic protection at Chigwell.

THE CHAIRMAN commented that the problem of using large-scale or small-scale tests occurred in many branches of scientific work. Account must be taken of the fact that accuracy of measurement fell off as the scale of the work was increased from the small scientific test towards the test under practical conditions; the cost also rose. There was frequently an optimum point where economy of effort, accuracy of measurement and correspondence to practical conditions most nearly coincided.

MR. N. J. PUGH (Corporation Water Undertaking, Coventry) spoke for the user of pipes and joined in the criticism of the tests on short lengths which, he said, could hardly indicate service conditions, nor could they indicate the internal stresses caused by the fluctuation of pressure, and he urged that tests should be carried out in close co-operation with the user. On the question of the cost of such tests he had heard a figure of £5 million quoted for replacement costs of buried pipes, and he thought that £10 million would probably be nearer the mark. Academic causes of corrosion were less important than a study of the way to lay pipes so protected that corrosion would not occur.

MR. E. W. RAWLINGS (Semtex, Limited) commented on the protection which cement mixtures could afford. Latex cement which could be sprayed on to pipes had been successful when used in conjunction with hessian or glass cloth to reduce mechanical damage when laying or back filling.

Co-operation Secured

Replying to the discussion, DR. VERNON said that the tests involving short lengths of pipe did not fail to take account of experiences with longer lengths in the field. Co-operation with actual users was an essential feature of the work, and every possible step had been taken to co-operate with water and gas engineers as could be seen from the standard form which was being widely used to report corrosion failures of buried pipes. The figure of £10 million replacement costs given by Mr. Pugh was itself an underestimate and the latest estimate was in the neighbourhood of £50 million. He agreed that there had been a tendency to over-emphasize the microbiological causes of corrosion and he and his colleagues had taken every opportunity of pointing out that microbiological corrosion was not basically different from electrochemical corrosion of which it was merely a special type. However, it should be pointed out that the very great majority of pipeline failures in this country had been associated with unmistakable symptoms of microbiological influences

Preventive Measures

MR. L. C. WHISKIN (Metropolitan Water Board) said the sub-committee on the corrosion of buried metals was now concentrating more on methods of prevention than on the causes of corrosion. In this connection he emphasized, in the case of main-laying, the importance of taking every care in the transport and handling of pipes and in the back filling of trenches in order to avoid damage to coatings.

MR. K. A. SPENCER of the Anglo-Iranian Oil Company, Limited, introduced both his own Paper and that by Monsieur R. de Brouwer, and continued by saying that to ensure protection a current of between 1 and 15 ml. amp. per sq. ft. of exposed metal was usually necessary. Hence the need for good and continuous coatings, which were complementary to cathodic methods. The potential between metal and electrolyte had to be assessed, and this could conveniently be measured by a high resistance voltmeter with a copper/copper-sulphate half-cell. Natural potentials were usually from -0.35 to -0.70 v. It had been found that if more than -0.85 v. was maintained, by application of cathodic protection full protection was provided. It was also necessary to survey the soil before applying cathodic protection; the most convenient method was to measure its electrical resistance. A broad designation was:—Very corrosive, less than 500 ohms per ml.; corrosive, 500-2,000 ohms per ml.; mildly corrosive, 2,500 ohms per ml. Where soil resistivities were very high, the potential developed by sacrificial anodes was not sufficient and the power-supplied system had to be used.

Monsieur de Brouwer's Paper dealt with cathodic protection by "polarised-drainage" and "forced-drainage," methods which had been extensively used on the Continent, where there were many tramways and railway lines using direct current, the presence of which complicated the practical installation of cathodic protection.

Measuring Potentials

MR. W. WESTWOOD (British Cast Iron Research Association) in the discussion raised a practical point in measuring potentials. He asked Mr. Spencer where he put the copper-sulphate half-cell when he was carrying out his measurements. If it were put in the soil above the magnesium anode, it gave a greater reading than if it were placed vertically above the pipe, which in turn gave a greater reading than if it were placed in remote earth.

Mr. Westwood mentioned that one must not forget that there were very many miles of water pipes that did not corrode, nor was corrosion always the cause of failure. Ground movements caused failures sometimes though subsequent corrosion might appear on a casual examination to have been the primary cause.

Deterioration of Properties

MR. J. F. KAYSER (Gillette Industries, Limited) said that cathodic protection was applicable not only to buried metals, but to parts of prime movers, chemical plant, fine instruments and the like. It was possible that on occasion parts of a machine or instrument might be fortuitously in a state of cathodic protection. He asked if either of the authors had found any evidence that the physical properties of cathodically protected metals were adversely affected.

Dr. Vernon replied that the alkali deposit might play a part in precipitating protective deposits.

MR. SPENCER, replying to Mr. Westwood's question about the half-cell, said he advocated placing it as near the pipe as possible.

Non-ferrous Metals

The paper contributed by the British Electrical and Allied Industries Research Association on "Corrosion of Buried Copper and Ferrous Strip in Natural and Salted Soils" was introduced by Dr. G. Mole and the Paper described an investigation to determine the relative corrodibility in different soils of metals used for earth electrodes. Over a period of 12 years the behaviour of cast iron, Armco iron, mild steel, galvanized mild steel, copper and tinned copper in 12 soils were investigated.

"Tests on the Corrosion of Buried Aluminium, Copper and Lead" by P. T. Gilbert and F. C. Porter was introduced by Mr. Porter. He described tests on tubes of commercial-purity aluminium, phosphorus-deoxidized arsenical copper, and lead buried at the same time and on the same sites as the ferrous specimens referred to in the first Paper.

Engineers' Appeal to Supply Minister

A deputation from the Engineering Industries Association saw Mr. Duncan Sandys, Minister of Supply, recently to express industry's concern over the shortage of metals and to indicate the extent to which programmes were being held up by the lack of raw materials. Industry felt, the deputation pointed out, that the emphasis on steel output had been by tonnage rather than selectivity, with the result that there was a dearth of certain types of steel. This is confirmed by the comparative ease of obtaining heavier sections as opposed to lighter ones. Some firms in the nut and bolt industry were only operating on a 50 to 60 per cent. production basis.

I.V.E. Whittle Competition

The Institute of Vitreous Enamellers announce the fourth Competition for the Whittle Silver Medal and cash prizes. The purpose of the competition is to encourage junior chemists and other technicians in the enamelling industry to put their ideas into the form of a written paper. Notes for the guidance of authors may be obtained on application to the Secretaries, John Gardom and Company, Ripley, near Derby, and all papers must be submitted by June 30, 1952.

The paper should be between 3, and 5,000 words, with the necessary illustrations, and must, of course, be written entirely by the competitor, although experimental work done by others can be referred to with due acknowledgment. Care must be taken to see that information given in the paper is not confidential, and competitors are advised to submit their script to their Company for approval before sending them for consideration. The competition is intended for junior staff, 30 years of age or under, but where a competitor has been on National Service or away from the industry on war service of another kind, and this is stated in a covering letter, the time on such service will be subtracted from his actual age and taken into consideration by the assessors.

PROVISIONS FOR THE EXPORT of between 15,000 and 20,000 tons of aluminium in 1952-1953 from Italy have been made under a programme drawn up by the Ministry of Industry and Commerce.

Mechanical Testing Handbook

The strength of materials of construction and the probable behaviour of these materials under load has been the concern of designers for very many years. The formulation of suitable tests by which the quality of metal products could be assessed without having recourse to full-scale testing was undertaken by the British Standards Institution as one of its earliest tasks. This resulted in the adoption of a series of standard tensile test-pieces. Since that time, a number of British Standards have been issued, which deal with different types of mechanical tests and a number of other standards include requirements for specific applications of these tests. The standards dealing solely with mechanical testing, together with extracts from other standards to illustrate particular applications of the tests, having been collected under one cover to form a new handbook, and so provide a reference book useful to industry and to universities and technical colleges where the subject of "strength of materials" is taught.

The development of standard methods of test and their importance in the field of mechanical testing, are reviewed in an introduction contributed by Dr. H. J. Gough, F.R.S., and the handbook has been arranged in sections which deal with types of tests; seven sections cover tensile tests, hardness tests, impact tests, ductility tests, the transverse tests for cast iron and the verification of tensile and compression testing machines.

Each section quotes in full the British Standards for the type of test being dealt with, and continues with suitable extracts from other Standards, where such exist, which illustrate particular applications of the test. The section dealing with tests on thin metal departs from this principle by quoting the whole of a Standard which deals comprehensively with the tensile, bend, hardness and ductility tests for thin metal sheet and strip material. The final section embodies a comprehensive series of conversion factors and conversion tables, which include values of stresses and moments of inertia converted from inch-pound units to metric units and *vice versa*. In addition to a general list of contents and a separate list for each section, an extensive index is included and suitable running headings are given for each page. Copies of the Handbook may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1., Price 17s. 6d. net, post free.

More Details on Steel Plan Wanted

The General Council of the Trades Union Congress has decided to inform the Minister of Supply, Mr. Duncan Sandys, that it could offer no detailed comment on the proposals to de-nationalize the iron and steel industry in the absence of some clearer indication of the Government's intentions. It agreed, however, to inform the Minister of its opposition to de-nationalization.

This decision was in answer to the recent request made by the Minister for the Council's views on the proposal. The Minister's letter was passed to the Council's economic committee, which considered it together with leaders of the iron and steel unions.

EUCLID (GREAT BRITAIN), LIMITED, which took over a factory block at Newhouse Industrial Estate 18 months ago, are to step up production and embark on a programme of expansion in 1952. Mr. W. Brown, personnel manager, said the expansion will require between 35 and 40 additional male employees early in the new year.

Imports and Exports of Iron and Steel in November

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in November. Figures for the same month in 1950 are given for the purposes of comparison and totals for the first 11 months of this year and of 1950 are also included.

Total Exports of Iron and Steel (tons)

Destination.	Month ended November 30.		Eleven months ended November 30.	
	1950.	1951.	1950.	1951.
Channel Islands	605	781	7,950	8,214
Gibraltar	86	77	1,532	782
Malta and Gozo	243	95	3,849	2,842
Cyprus	517	379	8,117	4,467
Sierra Leone	374	650	4,193	5,049
Gold Coast	1,851	2,246	22,268	17,596
Nigeria	8,165	3,473	57,144	48,626
Union of South Africa	14,865	5,984	166,537	117,993
Northern Rhodesia	2,217	987	26,212	15,018
Southern Rhodesia	4,542	1,878	63,904	34,250
British East Africa	7,293	7,379	90,787	70,328
Mauritius	735	416	8,127	6,044
Bahrein, Kuwait, Qatar and Trucial Oman	325	1,214	6,671	7,264
India	8,236	6,225	91,813	81,418
Pakistan	13,762	3,696	98,067	67,940
Malaya	5,874	6,507	70,464	68,246
Ceylon	4,789	1,290	33,864	24,039
North Borneo	1,889	280	6,567	4,279
Hongkong	6,802	2,065	47,641	46,009
Australia	46,044	22,889	405,730	296,424
New Zealand	16,423	11,573	164,757	99,801
Canada	33,792	29,661	207,901	255,103
British West Indies	6,196	6,994	58,044	62,106
British Guiana	218	439	6,513	4,923
Anglo-Egyptian Sudan	910	660	15,954	9,064
Other Commonwealth	1,331	1,807	14,934	11,789
Irish Republic	10,138	7,702	92,277	76,245
Soviet Union	1	—	539	2,258
Finland	6,573	6,036	67,091	40,166
Sweden	6,996	11,358	82,877	107,160
Norway	6,456	3,998	78,653	55,853
Iceland	472	219	4,106	2,463
Denmark	5,686	8,150	100,856	73,452
Poland	107	101	1,545	748
Germany	87	30	910	1,071
Netherlands	6,347	4,565	71,838	77,652
Belgium	1,943	1,139	13,134	10,899
France	1,684	334	22,717	5,002
Switzerland	839	560	9,993	9,925
Portugal	1,036	486	18,244	11,539
Spain	391	690	6,773	4,298
Italy	680	1,658	11,536	30,278
Austria	58	20	952	405
Hungary	—	—	330	23
Yugoslavia	1,343	37	12,473	7,369
Greece	575	94	7,164	2,356
Turkey	684	529	8,637	5,647
Indonesia	472	930	10,538	9,418
Netherlands Antilles	421	333	7,727	8,155
Belgian Congo	337	68	1,909	1,905
Angola	113	73	2,061	1,822
Portuguese E. Africa	417	142	4,424	3,641
Canary Islands	67	308	2,014	1,849
Syria	37	28	1,680	4,521
Lebanon	811	1,351	11,496	14,548
Israel	4,636	2,585	24,415	28,989
Egypt	5,874	1,670	55,680	36,861
Morocco	797	23	4,639	1,391
Saudi Arabia	19	819	2,199	2,147
Iraq	4,106	1,128	33,427	23,290
Iran	6,296	650	92,244	58,640
Burma	831	666	11,337	12,950
Thailand	2,072	1,086	9,560	14,199
China	1,644	10	6,027	4,623
Philippine Islands	519	671	8,533	3,578
U.S.A.	19,954	3,513	54,173	131,194
Cuba	176	116	2,096	3,596
Colombia	144	1,024	5,998	8,158
Venezuela	2,047	1,450	29,054	37,949
Ecuador	444	41	3,688	2,242
Peru	820	294	10,881	11,012
Chile	1,296	1,452	15,077	8,343
Brazil	3,185	2,905	30,325	21,540
Uruguay	985	153	9,616	10,005
Argentina	5,426	1,688	60,031	38,997
Other foreign	2,318	2,088	18,896	16,962
TOTAL	306,444	194,616	2,831,930	2,416,948

* The figures for 1951 are not completely comparable with those for previous years.

Total Imports of Iron and Steel (tons)

From	Month ended November 30.		Eleven months ended November 30.	
	1950.	1951.	1950.	1951.
India	15	2	22,945	14
Canada	3,185	4,097	35,915	45,751
Other Commonwealth and Irish Republic	138	292	1,549	1,864
Sweden	1,715	1,851	12,603	19,876
Norway	6,228	3,525	48,416	46,268
Germany	2,132	5,799	67,312	36,263
Netherlands	2,034	5,677	43,053	69,930
Belgium	7,355	26,209	89,148	174,437
Luxemburg	3,845	3,723	39,483	76,007
France	24,701	31,955	272,422	243,127
Austria	27	44	3,376	19,083
U.S.A.	4,861	5,748	60,953	44,997
Other foreign	142	6,786	6,257	13,376
TOTAL	56,378	95,708	703,432	790,993
Iron and steel scrap and waste, fit only for the recovery of metal	94,979	54,162	1,882,194	565,064

Exports of Iron and Steel by Product (tons)

Product.	Month ended November 30.		Eleven months ended November 30.	
	1950.	1951.	1950.	1951.
Pig-iron	5,914	323	32,055	15,605
Ferro alloys, etc.—				
Ferro-tungsten	112	12	1,083	387
Spiegeleisen, ferro-manganese	208	535	2,330	1,412
All other descriptions	135	82	1,429	977
Ingots, blooms, billets, and slabs	440	87	5,855	5,259
Iron bars and rods	822	373	4,498	7,901
Sheet and tinplate bars, wire rods	3,982	128	19,075	11,286
Bright steel bars	5,491	1,289	42,203	27,754
Alloy steel bars and rods	1,655	1,365	13,734	15,023
Other steel bars and rods	32,751	8,856	245,822	156,802
Angles, shapes, and sections	21,838	8,039	148,190	142,556
Castings and forgings	645	1,391	7,466	11,825
Girders, beams, joists, and pillars (rolled)*	6,291	3,094	63,209	35,053
Hoop and strip	12,291	5,411	110,981	69,827
Iron plate	234	24	2,416	1,732
Tinplate	21,413	17,418	227,155	213,627
Tinned sheets	215	122	2,595	2,176
Terneplates, decorated tinplates	48	83	815	1,478
Other steel plate (min. ⅛ in. thick)	26,737	25,741	304,326	247,533
Galvanized sheets	7,552	4,388	105,198	50,284
Black sheets	9,341	8,437	127,125	135,978
Other coated plate	820	302	11,170	7,460
Cast-iron pipes up to 6 in. dia.	7,744	9,995	71,268	78,366
Do., over 6 in. dia.	7,565	7,975	74,806	66,104
Wrought-iron tubes	36,647	26,003	322,320	355,403
Railway material	30,000	11,640	287,618	194,730
Wire	10,127	4,925	79,719	54,484
Cable and rope	3,048	2,349	30,995	26,812
Wire nails, etc.	2,385	1,445	23,515	23,728
Other nails, tacks, etc.	525	385	4,695	3,850
Rivets and washers	860	543	7,698	6,946
Wood screws	394	454	3,739	3,850
Bolts, nuts, and metal screws	2,643	2,542	28,562	26,287
Baths	1,027	1,232	12,772	13,499
Anchors, etc.	645	810	8,289	8,499
Chains, etc.	871	1,087	9,568	10,463
Springs	872	744	7,792	6,162
Holloware	7,688	3,917	80,765	32,838
TOTAL, including other manufactures not listed above	306,444	194,616	2,831,930	2,416,948

More Diesels for British Railways

In the course of a five-year plan to increase efficiency, British Railways plans to add 573 Diesel shunting engines to its fleet of locomotives during 1953-57. The present stock of this type of engine is 130 and a further 84 have already been authorised. The five-year plan is additional to these and is the result of an extensive investigation which revealed that economies could be obtained and efficiency increased by changing over from steam to Diesel traction in many of the larger marshalling and goods yards and on dock sidings. The provision of 573 Diesel engines will enable 635 life-expired steam-engines to be scrapped, but progress of the plan depends on the permissible level of investment expenditure, steel supplies, and manufacturers' ability to provide Diesel engines and transmission equipment.

The scheme provides for 432 Diesel-electric engines of 350 h.p. and 141 Diesel-mechanical engines of 150/200 h.p.; as a first instalment 57 of the former and 12 of the latter are to be included in the 1953 locomotive renewal programme. The balance of the 141 Diesel-mechanicals will be subject to the performance of the first 12 under traffic conditions. Main frames, wheels, cab structures, and mechanical parts will be built in the British Railways workshops and the Diesel engines and electrical transmission equipment purchased from contractors which specialise in their design.

The advantage of Diesel operation in Britain is most marked in shunting yards where employment is continuous, but trials are continuing with high-powered Diesel locomotives on general passenger and freight working.

Mechanical Engineering Congress

The fourth International Mechanical Engineering Congress will be held in Stockholm from June 4 to 10, 1952, when papers and discussions will be centred on improvements of materials used in engineering manufacture.

Organised by the trade associations serving the mechanical engineering industry of Belgium, Denmark, Finland, France, western Germany, Great Britain, Italy, Netherlands, Norway, Spain, Sweden, and Switzerland, the 1952 congress will include visits to the works of Allmänna Svenska Elektriska AB (A.S.E.A.), AB Atlas Diesel, AB Scania-Vabis, Svenska AB Gasaccumulator (A.G.A.), AB Svenska Metallverken, and Telefon AB L.M. Ericsson. Details of the congress may be obtained from Mr. A. W. Berry, director of the British Engineers' Association, 32, Victoria Street, London, S.W.1.

Production and Consumption of Sulphur

The Sulphur Committee of the International Materials Conference has released figures showing, for the first time, the total free world production and consumption of sulphur for the period 1948-49-50, and estimates for 1951-52. The information confirms the committee's earlier view that in 1951 world requirements of sulphur, both crude and refined, amount to approximately 7,134,200 long tons, whereas it is expected that production will amount to 5,862,300 tons, leaving a shortage of 1,271,900 tons; and that in 1952 the requirements are estimated at 7,596,300 tons while production foreseen is 6,255,600 tons, leaving a shortage of 1,340,700 tons. In the light of these statistics the seriousness of the sulphur shortage, states the committee, is apparent. It is making every effort to encourage governments to increase their production, not only of sulphur, but of all sulphur-bearing materials. All countries are urged to make the most economical use of the amounts of sulphur available to them.

A.B.E.-Henry Meadows Share Bid

Associated British Engineering, Limited, has offered to purchase the whole of the remaining 71,700 5s. ordinary shares of Henry Meadows, Limited, not already owned by A.B.E. for a consideration of one ordinary 5s. unit in the Brush Electrical Engineering Company, Limited, for each share held. The transfer of Brush Electrical shares will be ex any final dividend which may be declared in respect of 1951. Shareholders of Henry Meadows, Limited, Wolverhampton, petrol and Diesel engine and gearbox manufacturers, have been informed that no ordinary dividend is recommended for the year ended August 31 last. No payment has been made since 1946.

Associated British Engineering also intends to make an offer for the whole of the 200,000 5 per cent. cumulative preference £1 shares in Henry Meadows by way of issue and allotment of one cumulative preference unit in A.B.E. for every Meadows preference held. This offer is subject to the acceptance of the ordinary offer and A.B.E. stockholders' approval to raising the 5½ per cent. preference interest to 6 per cent. and to increasing the preference capital to permit implementation of the offer.

Increasing Nickel Production

The nickel output according to available figures reached 295,000,000 lb. in 1951, an increase of more than 10 per cent. on 1950 output, according to a review of the nickel industry by Dr. John F. Thompson, chairman and president of the International Nickel Company of Canada, Limited. Efforts are being made to ensure that output is maintained and increased, and it is expected that by 1954 nickel production will be 30 per cent. higher than before the Korean conflict. Expansion developments at the Falconbridge Nickel Mines will serve to increase the maximum annual production rate from 25,000,000 lb. to 40,000,000 lb. in the course of three years, it was stated by Dr. Thompson.

Wide exploration and prospecting for new nickel deposits, he continued, was being carried on by the company in Canada, Africa, and elsewhere. There was an urgent need to increase scrap supplies. Failure to do so tended to exaggerate the demand for primary metal, and a balanced flow of nickel scrap would go far to relieve present conditions.

Vickers-Armstrongs Representation

Announcement was made in the JOURNAL dated December 20 of the reorganization of the representation in South Africa of Vickers-Armstrongs, Limited, and Metropolitan-Cammell Carriage & Wagon Company, Limited.

It has now been announced by the company that Mr. D. W. Stanley, who will be chairman of Vickers-Armstrongs South Africa (Pty.), Limited, was incorrectly given the title of chairman and managing director in the information first supplied.

Oil Prices

The maximum prices of gas oil, fuel oil, heavy fuel oil, and aviation spirit are unaffected by the changes in other petroleum products announced by the oil companies, which became effective on December 21. Bulk and ex-pump prices of motor spirit, Diesel oil for road vehicles, and vaporising oil are ¼d. a gallon higher. White spirit (London zone) has been raised by ¼d. and kerosene by ⅛d. a gallon.

Personal

MR. WALTER BRINDLEY has been appointed to the board of directors of Dartmouth Auto Castings Limited.

MR. W. T. COX (Staveley Iron & Chemical Company, Limited) has been elected an associate of the Chartered Institute of Secretaries.

MR. E. L. ROTH, of Motor Castings Company, West Allis, Wisconsin, has been re-elected president of the Gray Iron Founders' Society of America.

MR. W. HICKENBOTTOM, foundry foreman of Bagshawe & Company, Limited, Dunstable, retired on December 31, 1951, after 36 years' service with the company.

MR. J. HOWDEN HUME, managing director of James Howden & Company, Limited, engineers, Glasgow, has been appointed president of the Scottish Engineering Employers' Association.

MR. C. L. COOKES has been appointed area representative in the Midlands and South Wales of E. Boydell & Company, Limited, manufacturers of dumpers and loaders, etc., of Manchester.

MR. W. GIRLING has been appointed manager of the Newcastle-upon-Tyne works of Aveling-Barford, Limited, manufacturers of road machinery, etc. The works was opened six years ago.

MR. W. T. BELL, chairman and managing director of Robey & Company, Limited, the Lincoln engineers, has been appointed Sheriff of the City of Lincoln, an office which was held by his father in 1884.

MR. J. S. AKED, general production manager of Francis Morton & Company, Limited, the Liverpool engineers, and Mr. J. A. Johnston, secretary of the company, have been appointed special directors.

A PRESENTATION has been made to MR. WILLIAM SHERET, to mark the completion of his 50 years' service with T. W. Greenwell & Company, Limited, ship repairers, etc., of Sunderland, of which he is secretary.

MR. J. W. BERRY, joint managing director of the Birmingham Aluminium Casting (1903) Company, Limited, one of the companies of the Birmid Industries group, leaves for a business visit to America at the beginning of January.

MR. C. T. ROBERTSON, buyer for the past 44 years with G. & J. Weir, Limited, Cathcart, Glasgow, retired on December 28 after 51 years with the firm. He was presented by Mr. J. K. Weir, managing director, with a wallet of notes and a handbag for his wife.

MR. P. BUTLER and MR. W. B. LAING have been appointed joint general managers of Bruce Peebles & Company, Limited, Edinburgh, as from January 1. Both have a long association with the company and have been intimately connected with the great expansion in the transformer, rectifier, and rotating plant business.

MR. M. H. METCALFE, deputy manager, and MR. H. CARBARNS, chartered accountant, are to retire from the Carron Company, Falkirk, this month. Mr. Metcalfe has been with the firm 48 years and deputy manager for the past nine. Mr. Carbarns is an old Watsonian and native of Edinburgh and has been with the firm 32 years.

AFTER 41 years' service in the sales division of the British Aluminium Company, Limited, London, MR. W. H. PLATT, assistant sales manager (wrought products), is retiring at the end of the year. He will be succeeded by MR. C. F. BATSTONE, who will combine his new duties with the functions of principal assistant sales manager.

MR. J. T. BURFORD, works manager of W. & T. Avery, Limited, Soho Foundry, Smethwick, distributed prizes valued at over £100, on December 20, to sixteen apprentices who had achieved examination successes. Mr. Burford told apprentices that men who will have control in industry of the future will be those who realise that their fellow workpeople are not just check numbers.

MR. H. S. GOSNEY, who as Midland Regional Controller of the Ministry of Labour for the past nine years has done so much to assist in maintaining adequate manpower in local foundries, was presented with a silver cigarette case and cheque in a valedictory ceremony at the regional headquarters, Birmingham, on December 20. He left for the Southern Region at the end of the month.

MR. J. A. OWEN, managing director of Consolidated Pneumatic Tool Company, Limited, has celebrated his jubilee with the company. Mr. Owen joined the firm in Fraserburgh when it opened in 1905, and became works manager in 1918. He occupied that post for the following six years. To mark his jubilee he was entertained at dinner and presented with a walnut writing desk. Telegrams and cables were received from all over the world congratulating him on his splendid record and testifying to work ably done.

Obituary

MR. F. MALLETT, works manager of the Birmingham Railway Carriage & Wagon Company, Limited, died on December 28 at the age of 74. He had been with the firm for 52 years and was due to retire early this year.

MR. E. MILLER, for many years foreman of the general-stores department, at the Chesterfield Tube Company, Limited, died recently. Later, and until the time of his death, he was foreman of the cylinder-disposal section, and was due to retire next year.

THE DEATH is announced of MR. GERALD CLAYTON, for many years the London manager of the Incandescent Group. Mr. Clayton was an active supporter of the London branch of the Institute of British Foundrymen, which he joined in 1928. He died on December 27, 1951. He was also a director of Controlled Heat & Air, Limited, and had been 22 years with the Group. Mr. Clayton was one of the early members of the Institute of Vitreous Enamellers, and was also a member of the Iron and Steel Institute.

THE DEATH took place on December 27 of MR. HARRY BINNS, at his home at Morecambe, at the age of 82. Prior to his retirement, Mr. Binns was for many years the engineer for Hattersley, Sons & Company, Limited, Haworth, near Keighley. He was a past-president of the Keighley Association of Engineers.

WIDELY KNOWN in the Midlands foundry trade, Mr. Harold Biddulph, chairman of M. A. Johnson, iron and steel founders, West Bromwich, has died at Rhyl at the age of 53. He was also chairman of Bidson, Limited, tube manufacturers, and was associated with Vaughan & Jones, tube manipulators. He had been in ill-health for two years.

MR. JOHN WALLACE, J.P., of Kilmarnock, who has died at the age of 72, was secretary of Barr, Thomson & Company, engineers, from 1905. He was only the second secretary the company had had since its formation. He succeeded the late Mr. Hugh Weir who held the post from 1897 until 1905. During his period of service, Mr. Wallace worked under five managers. He had also numerous interests outside of the business, being for 14 years a member of the town council.

Scrap Iron and Steel Prices

Maximum prices of scrap iron and steel were raised on December 31 by amounts varying from 1s. 8d. to 3s. 6d. per ton.

The following table gives current prices for representative grades of scrap iron and steel for use in foundries. They should be read in conjunction with the following notes:—

All prices are per ton of 2,240 lb., delivered free at consumers' works, and are subject to the addition of 5 per cent. when the seller is *bona fide* a scrap iron and steel merchant.

Where delivery of scrap of any one specification (exclusive of cylinder blocks or heads) under an order for 50 tons and upwards is tendered in quantities of not less in the aggregate than 50 tons per three months, the tabled prices are to be increased by 2s. 6d. per ton.

For *cast-iron scrap* (exclusive of cylinder blocks or heads) arising in Scotland and for use in Scotland, the prices in the table are subject to the following:—(1) Less 3s. per ton and less the excess (if any) of the actual cost of transport to consumers' works over 6s. per ton for deliveries free on rail or on lorry at loading point; (2) less 3s. per ton, but plus the actual cost of transport or 6s. per ton, whichever is the less, for deliveries free to consumers' works.

Cast-iron motor-engine cylinder blocks or heads (free from steel and non-ferrous metal)—187s. 8d. in all districts.

Scrap hematite-iron ingot moulds and bottom plates (other than for the manufacture of steel ingots), in pieces not exceeding 1½ cwt. in weight—197s. 2d. in all districts.

Malleable cast-iron scrap, in cupola sizes—149s. 11d. in all districts.

Maximum Prices of Scrap Iron and Steel for Use for Iron and Steel Foundry Castings.

District.	Steel rails, tyres and fishplates.	Other short heavy steel.	Heavy machinery cast iron.	Ordinary heavy cast iron.	Cast-iron railway chairs.	Medium cast iron.	Light cast iron.	Burnt cast iron and firebars.	Steel turnings.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Scotland	133 2	130 8	145 5	140 5	145 5	128 5	123 5	108 11	101 5
Northumberland, Durham, and Middlesbrough	133 5	130 11	142 11	140 5	140 5	130 8	125 8	116 2	104 5
Cumberland	133 2	130 8	139 8	134 8	134 8	125 11	120 11	113 8	106 5
Westmorland, Lancs. and Wirral Peninsula	130 8	128 2	135 8	130 8	130 8	123 5	118 5	109 11	99 5
West and North Ridings of Yorks. (excluding Middlesbrough)	131 8	133 2	138 2	133 2	133 2	128 5	123 5	113 8	101 11
East Riding of Yorks.	135 8	133 2	141 8	139 5	140 5	128 5	123 5	113 8	101 11
Derby. and Notts.	135 8	133 2	140 8	138 2	138 2	130 5	125 5	113 8	101 11
Lincoln. and Cambridge	135 8	133 2	138 2	135 8	138 2	128 5	123 5	115 2	103 5
Cheshire (excluding Wirral)	130 8	128 2	137 8	132 8	132 8	122 11	118 5	108 5	104 5
Anglesey, Caernarvon, Denbigh, Flint, Merioneth, Montgomery, and Radnor	128 5	125 11	135 8	130 8	130 8	120 11	116 2	113 8	104 5
Shrops., Staffs., Worcester., and Warwick	128 5	125 11	143 5	138 8	138 8	131 5	126 5	116 2	97 8
Leics., Northants, Hunts., and Rutland	133 2	130 8	140 11	136 2	138 5	126 5	123 5	111 2	102 5
Norfolk	133 2	130 8	139 2	134 2	139 2	124 5	119 8	109 8	102 5
Suffolk	133 2	130 8	140 2	135 2	140 2	126 8	121 11	111 11	102 5
Cardigan, Brecknock, Carmarthen, Pembroke, Glamorgan, Monmouth, Hereford and Gloucester	135 8	133 2	144 5	141 11	144 5	133 11	129 5	118 5	105 5
Somerset, Dorset, Wilts., Hampshire and Sussex	128 5	125 11	138 2	133 2	133 2	123 5	118 8	108 8	97 8
Oxford, Berks., and Beds.	128 5	125 11	140 5	135 8	135 8	128 5	123 5	113 5	97 8
Essex and Kent	128 5	125 11	138 2	133 5	133 5	124 8	119 8	103 11	97 8
County of London	128 5	125 11	135 5	130 8	130 8	123 5	118 5	105 11	97 8
Middlesex, Surrey, Herts. and Bucks.	133 2	130 8	135 11	131 2	131 2	123 11	118 11	103 11	97 8
Cornwall and Devon	128 5	125 11	128 5	123 5	—	113 8	108 11	98 11	—

Linseed Price Increased.—The Minister of Food announces that the price of crude linseed oil will be raised from £180 to £190 per ton naked ex works as from December 30, 1951.

Killed because of Loose Clothing.—Evidence given at an inquiry in Greenock Sheriff Court into a fatal accident showed that a workman operating a radial drill was dragged into it because the cuff of the right sleeve of his shirt was unbuttoned. Robert Kerr, drilling-machine operator, of Greenock, was stripped of his clothing by the drill on November 7 and sustained extensive injuries from which he died in Greenock Royal Infirmary on the same day. Kerr was employed at the Eagle Foundry of Rankin & Blackmore, Limited, marine engineers, Greenock. It was stated that when his clothes were removed from the drill the last article was the right sleeve of his shirt. The point of the drill had gone through the buttonhole.

GLENFIELD & KENNEDY, LIMITED, Kilmarnock, are to erect an amenities building within their works. This will consist of a foundry bathing and changing room, estimated to cost £15,000.

NEARLY 400 RELATIVES AND FRIENDS enjoyed the privilege of a tour through the workshops of George Fletcher & Company, Limited, Litchurch Lane, Derby. They saw many parts of sugar machinery in the process of manufacture, which on completion will be sent to all parts of the world. After the inspection, tea was taken in the works' canteen.

A £500-A-YEAR RESEARCH FELLOWSHIP at Glasgow University for the study of high-speed problems in aircraft has been set up by the English Electric Company, Limited, which developed the Canberra jet bomber. Under Prof. W. S. Duncan, holders of the fellowship—the first will be elected early in the new year—will investigate problems of the vibration, stability and control of planes.

News in Brief

THE PARIS INTERNATIONAL TRADE FAIR is to be held from May 17 to June 2. More than 10,750 firms from 30 nations have taken space.

AN ORDER, valued at over £4,500,000, for two new liners of about 20,000 gross tons each has been placed with John Brown & Company, Limited, Clydebank, by the Cunard Steam Ship Company, Limited.

THE BELLS at the Parish Church of Breedon-on-the-Hill, recently were rung by a team of ringers from Taylor's, bellfounders, Loughborough. The bells had been newly made or re-cast at the foundry.

BARCLAY, CURLE & COMPANY, LIMITED, Glasgow, have secured a further addition to their order books by a contract to build a cargo vessel of 10,000 tons dw. for the Australian Steamship Company, London.

BRITISH POLAR ENGINES, LIMITED, Glasgow, have received orders for 17 engines worth about £200,000. Sixteen of the engines are for marine propulsion and one for industrial use. Together they equal over 13,000 h.p.

THE FOURTH LONG-SERVICE CELEBRATION of Robey & Company, Limited, engineers and boiler makers, of Lincoln, was held recently, when over 300 employees with more than 10 years' service were entertained by the directors.

FOUR DAYS after the fire outbreak at the H. J. Enthoven factory at Thornton Heath, Surrey, workers engaged were able to return to normal duties. The fire did not affect foundry machinery and orders are being fulfilled promptly and production is maintained.

AT AN ORDINARY GENERAL MEETING of the Newcomen Society to be held on January 9 at 5.30 p.m. at the Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1, the Paper "Early Refining of Pig-iron in England" by H. R. Schubert, M.A., Ph.D., will be presented.

THE 15TH FOUNDRY SYMPOSIUM organized by the Giesserei-Institut, Rheinisch-Westfälische Technische Hochschule, Aachen, Germany, is to be held from March 12 to 15. Those desiring to submit Papers should ensure that their typescript reaches Aachen before February 15.

THE 2,570 EMPLOYEES of Ley's Malleable Castings Company, Limited, and the Ewart Chain Belt Company, Limited, of Derby, who were eligible under the rules of the profit-sharing scheme, which was started by the late Sir Gordon Ley in 1919, received a total of £52,000 profit last week.

AT the head-office annual Christmas lunch of Hall & Pickles, Limited, steel and tool makers, Mr. E. N. Hall, joint managing director, presented gold watches to seven members of the warehouse, works, staff, and outside representatives who had completed 25 years' service with the company.

LHASA (TIBET) will soon be receiving its first electricity supply. David Brown & Sons (Huddersfield), Limited, has despatched the last of three units forming part of a water-turbine generating set which serves the city. The unit, which weighs 4½ tons, will be carried over the Himalayas by yak.

ON MONDAY, January 7, Mr. Frank McLeavy, M.P. for Bradford East, will open the new premises of the sports club of Hepworth & Grandage, Limited, Bradford, at Alma House, Sticker Lane, Bradford. Membership of the club is open to any of the 3,700 employees at the works on payment of a fee of 2d. a week.

A WHOLLY-OWNED SUBSIDIARY, British Oxygen Engineering, Limited, has been formed by the British Oxygen Company, Limited. This is an internal arrangement under which the engineering works of the British Oxygen Company at Edmonton (London) will be owned by the new subsidiary. The new company has an authorised capital of £2,000,000.

GLASGOW EDUCATION COMMITTEE gave approval on December 21 to the development of three sites for the accommodation of specialised forms of further education. The development relates to the rebuilding of Stow College at a cost of £350,000, so that it may become a central college for the building and allied trades, with accommodation for about 750 students.

ATTENTION is drawn to the review of a publication on page 708 of the December 20, 1951, issue of the JOURNAL which is wrongly described as having been issued by ALAR Limited. Actually it has been prepared by, and is available from, the Aluminium Development Association, 33, Grosvenor Street, London, W.1.

AN INTERESTING EVENT took place at Mildmay Ironworks, Burnham-on-Crouch, this week, when three watches were presented by the directors to employees who had completed over 40 years' loyal service with the firm—Mr. E. J. Blunden, who joined the firm in 1910, and Mr. L. G. Thomas and Mr. Wm. Clarke, both of whom joined the firm in 1911. This is the second occasion on which such a presentation has been made, the first being at the firm's 50th-anniversary dinner two years ago, when 12 watches were presented.

IN ITS "Prospects for 1952," the Birmingham Chamber of Commerce, with which many leaders in local foundry trades are associated, refers to "the industrial world starving for raw materials and, in consequence, with both the armament and export drives in jeopardy." Stating that "it is therefore safe to prophesy that for this country the New Year will not be too happy," the survey nevertheless strikes a note of hope in its conclusion that "there is ground for the belief that, having advanced so far along the hard road to recovery and having surmounted difficulties which might easily have cowed a less virile and resilient people, there will be a date, not too remotely distant, when we can pause on the hill top, content in the knowledge that long-sustained, self-sacrificing effort has met with the reward it deserves."

Hobkirk's Long-service Awards

Last Friday, presentations for long service were made to five employees of J. Hobkirk, Sons & Company, Limited, of Bedford, by the directors. Four of the recipients were presented with television sets to mark the completion of 25 years' service; they were Mr. F. Keep, a coremaker; Mr. H. Lovell and Mr. F. Loosely, moulders; and Mr. J. Newman, transport chargehand. A gold watch was also given to Mr. C. Brimblecombe, a fettler, to mark the completion of 19 years' service. Mr. Brimblecombe is in his eighty-third year, still does a full week's work on the bench, and is one of the firm's most conscientious time-keepers. It is interesting to note that he started with J. Hobkirk & Company, Limited, when he was 64 years of age, a time when most are thinking of retiring, and has worked long enough since then to receive an award for long service. The presentations were made by Mr. J. T. Hobkirk, chairman of the company, who is himself in his eighty-fifth year and still comes to business every day. Prior to the presentations, there was a Christmas party for employees' children.

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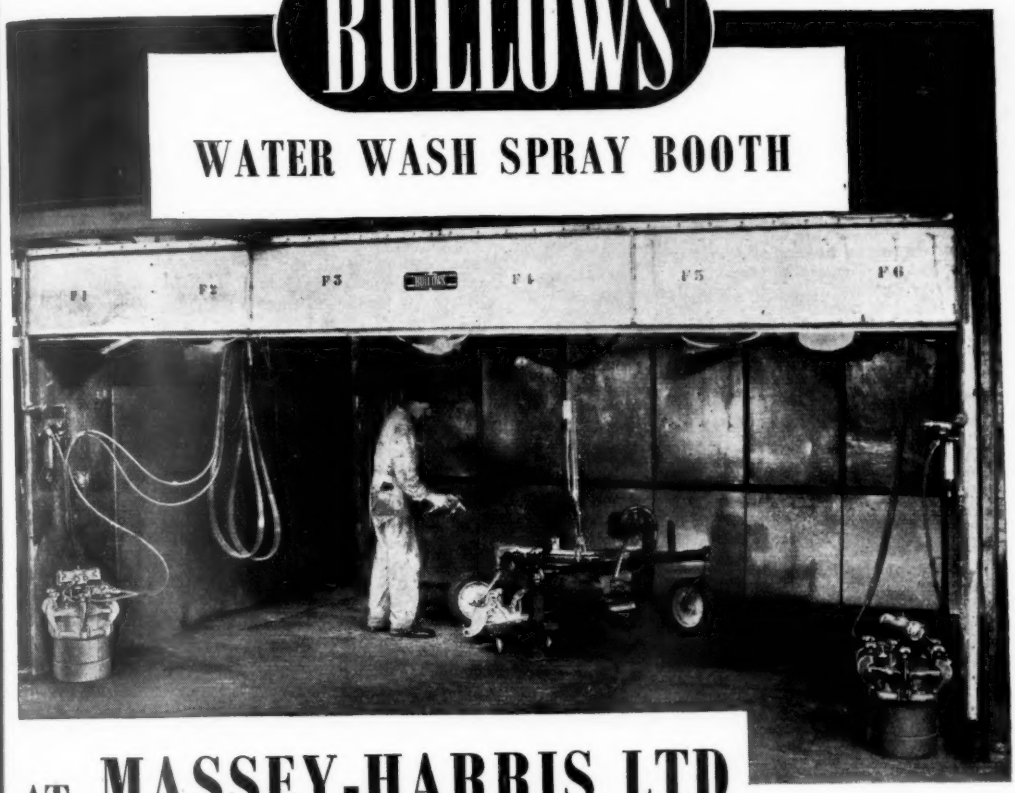

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Raw Material Markets

Iron and Steel

The Christmas and New Year holidays resulted in a small accumulation of pig-iron and coke for many foundries, as deliveries were accepted during the closure, but prospects are still far from happy. The quantities of pig-iron available for distribution to the foundries are as stringent as ever, and the position is not likely to improve until a larger quantity of the foundry grades of iron is made available from the furnaces now in blast or until additional units are blown in. Steelmakers continue to receive the major share of the increased blast-furnace production and more is required by them to make up for the shortage of scrap. As things are, many buyers of foundry iron are unable to book the full licensed tonnages for the current period; deliveries against orders in hand are barely sufficient for immediate needs.

The engineering and speciality foundries are clamouring for larger tonnages of the low- and medium-phosphorus irons, as well as hematite and refined iron. The light and jobbing foundries are also in a difficult position, and deliveries of high-phosphorus iron need to be stepped up considerably to meet all their demands.

Available parcels of suitable cupola scrap, including both cast iron and steel, are eagerly sought. Stocks are very low, and the shortage of imported scrap is adding to current difficulties. Foundry coke deliveries continue to come forward regularly, but the foundries have little to spare after immediate needs are satisfied. Ganister, limestone, and firebricks are received to requirements.

The majority of the re-rollers were closed all last week. Apart from supplies from home sources, very little semi-manufactured steel is coming forward and users are extremely short of material, so much so, in fact, that day-to-day working is general. Production of the small sizes of sections, bars, and strip is at a low level, although users are pressing desperately for supplies. Sheet re-rollers are also suffering from restricted outputs, owing to shortage of sheet bars.

There is no difficulty in obtaining business for all the products of the re-rollers, but with the new authorisation scheme coming into force on February 4 and with their present heavy commitments, very little new business is being accepted.

Non-ferrous Metals

The International Materials Conference announced just before the holidays the allocations of copper and zinc for the first quarter of the present year. As might be expected, the United States secures the highest tonnage, with Great Britain second. It is satisfactory to note that we are allocated more than in the previous quarter, the copper tonnage going up to 100,000 metric tons and the zinc figure to 64,000 metric tons. If these figures, which are, of course, permissive, can be maintained throughout 1952 we shall not fare too badly, and certainly better than last year, when supplies of zinc especially, were distinctly poor and much below the country's needs.

The Ministry of Materials is believed to have made purchases of zinc outside its contracts with the Dominion producers, and this metal will provide a useful addition to the bulk tonnage. It has also been suggested that purchases of Mexican lead were made recently on the basis of 19 cents so that it would seem as though we are not too badly supplied.

As for copper, the quota secured for this quarter indicates some optimism on the part of the Ministry regarding the outlook for the present year, for it certainly did not distribute 400,000 tons of primary copper in the U.K. during 1951.

It was announced last Saturday by the Ministry of Materials, that as from January 1 the price of aluminium in ingot form would be increased by £24 per ton to £148 per ton delivered consumers' works. The extra for metal in notch-bar form remains at £2 10s. as hitherto. The new price applies to 99 per cent. to 99.5 per cent purity and there has been an adjustment in the premiums charged for higher purities, fortunately in a downward direction. Minimum 99.8 per cent., for example, previously commanding an extra £17, is now to be charged only £8 additional. Minimum 99.6 per cent. metal is now rated at an additional £2 and 99.7 per cent at £4 extra.

The official explanation of the increase of £24 in virgin aluminium is that it is due to increased cost to the Ministry of imported supplies and of distribution. This exceedingly vague phraseology leaves the consumer, confronted with an over-night rise of about 20 per cent. in raw material, very much in the dark. But this is how things happen under a system of bulk purchasing, which everyone wishes it were possible to abandon.

London Metal Exchange official tin quotations were as follow:—

Cash—December 24, £910 to £912 10s.; December 27, £907 10s. to £912 10s.; December 28, £902 10s. to £905; December 31, £905 to £907 10s.; January 2, £927 10s. to £930.

Three Months—December 24, £910 to £912 10s.; December 27, £912 10s. to £915; December 28, £902 10s. to £905; December 31, £905 to £907 10s.; January 2, £927 10s. to £930.

The market was closed on Tuesday.

Aluminium Scrap Costs More

An Order, the Aluminium Scrap Prices (No. 2) Order, 1951, increasing the price of aluminium scrap, came into effect on Tuesday. The Order establishes a maximum price for new pure aluminium foil scrap suitable for use in the manufacture of aluminium flake powder and aluminium paste and increases the maximum prices formerly prescribed for other kinds of aluminium scrap and aluminium alloy scrap. The new prices take account of the recent advance in the price of virgin aluminium.

Subject to certain additions which the Order permits in respect of bagging and for delivery at consumers' premises, the maximum prices, with the previous prices in parentheses, are as follow:—

New pure aluminium foil scrap for flake powder, £148; other new pure aluminium scrap, £113 (£96); old rolled or extruded pure aluminium scrap, £101 (£86); clean aluminium alloy scrap, £95 (£81); aluminium turnings, £69 (£59); other aluminium scrap and aluminium alloy scrap, in proportion.

Mr. T. E. Whiteside, A.C.A., has been appointed as secretary of the British Cast Iron Research Association. Previously, his duties were carried out for many years by the director, Dr. J. G. Pearce.

Six employees of the assembly department of Babcock & Wilcox, Limited, Renfrew, who retired at the end of the year with an aggregate total of 231 years' service, and who received gifts, were:—Mr. P. Moran, of Renfrew (50 years); Mr. R. Sproul, of Paisley; Mr. J. Clink, of Paisley; Mr. J. Campbell, of Renfrew; Mr. J. Drury, of Glasgow; and Mr. J. Wilson, of Renfrew.